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The Electrical Mind

THE electrical industry is peculiarly rich in opportunities for the discussion of its technical and commercial problems. Few industries, we imagine, can offer their members such a variety of platforms and debating circles as are provided by the Institution of Electrical Engineers, the Incorporated Municipal Electrical Association, and the long list of additional bodies representing sections or groups of sections of the electrical field.

As a rule our discussions are about current questions. The Faraday Celebrations bring before us the whole course of a hundred years of electrical progress and set it in the broad perspective of our industrial history. Within that brief period we have seen the evolution of not one, but many, industries from a single laboratory experiment. Moreover, the electrical industry is so recent that some of its pioneers are still active among us.

It would be difficult to find a parallel for such swift development of so numerous a group of co-ordinated enterprises. It may be thought that we have not advanced rapidly enough, or have left certain avenues imperfectly explored, and indeed in certain cases progress has been retarded by what may be described as the conservatism of the electrical mind.

In the days when electric light was the chief commodity, missionary zeal for its economies and secondary advantages was not the characteristic of the industry. Had it been so, we should not have had to wait so long for the development of the business side of electricity supply. The policy of extending mains only where customers had been obtained in advance was, in the final analysis, an expression of an underlying scepticism about the supremacy of electric light. Similarly, when electric cooking and heating approached the economical stage, their advocates found that their hardest task was to induce conviction among the very people who, by profession, might have been expected to give the new method the benefit of the doubt. Theoretically, the electrical mind should have been ready to assume the superiority of the electrical solution, at least until it had been disproved. In practice what was demanded at the outset was a complete demonstration of overwhelming advantages before any steps would be taken to exploit the proposed application.

In the case of battery traction it was only in a minority of cases that electrical undertakings were prepared to take any risks, either by testing this method for themselves or by encouraging it with a low charging tariff. Had a generous pro-electric policy been adopted everywhere, the losses incurred would, at the worst, have been trifling and the possible benefits in popularising the electrical idea would have been considerable.

A parallel case is presented by the electric propulsion of ships. When this development was first proposed, it met with its keenest critics in the electrical world itself. The problem was undoubtedly a complex one, and many

of its factors could not be determined save after a practical test. But these very conditions should have suggested to an electrical industry keen on realising every electrical possibility the necessity of carrying out large-scale experiments.

Coming to the present day, one may consider the attitude of the industry towards railway electrification. Here is a scheme which promises not only a steady large-scale demand for electrical plant and apparatus for twenty years, but also a powerful stimulus to electricity supply. When the railway load is added to the domestic and industrial loads, the price of the unit all round will come down, and the prospects of achieving the all-electric home and rural electrification will become much brighter than they otherwise could be. Such, in general, is the case for the scheme; and one might expect every electrical man, as a matter of course, to take the keenest interest in it. There are signs, however, that among the rank and file of the industry the Weir Report is still unfamiliar, and its importance to every branch of electrical enterprise is not yet realised. If, by way of apology, it is argued that we must wait to see what the Government and the railway companies intend to do, the answer is that both bodies are influenced in their decisions by professional and public opinion.

Apathy from the industry itself will encourage the authorities in timidity or inaction. On the other hand, everyone concerned in the electrical industry can, both publicly and privately, do something to ensure that the scheme will be properly understood and sympathetically considered. Even were he to display a slight excess of zeal in his partisanship, he would be more readily forgiven than for indifference, and he would do something to redress the former time-lags due to the high internal resistance of the electrical mind.

Deptford (West)

THERE is every reason for focusing attention on the article this week describing the Deptford (West) power station of the London Power Co., Ltd. The entire installation represents an excellent example of British engineering practice from both the manufacturing and operation points of view, and in the comprehensive account there is much information of value and interest. Sandwich firing with 20 per cent. coke breeze, coupled with the notably high thermal efficiency and cleanliness of the stacks, is a particularly interesting feature which, with the adoption of retort stokers for the new boilers, after experience in both the Deptford stations, offers much food for discussion on the prevailing controversial topics bearing on fuel combustion generally. The handling of riddlings by pneumatic equipment, and the treatment of the ashes in grading plant before sale, are two more of the many items worthy of special note. In the light of the two schools of thought leading to extremes of simplicity and complexity, respectively, the general design may be said to follow the mid-way line. Does this indicate the ideal happy medium?

Another Hundred Thousand

WE suggested last week that Leeds would be the next after Birmingham to connect its hundred-thousandth consumer. Mr. C. Nelson Hefford points out in this issue that this had already been done and so our congratulations to him and his department are overdue. Leeds has a much smaller population than Birmingham.

The I.E.E. Council's Nominations

LAST week we gave the names of members of the I.E.E. who had been nominated for election to the Council. These nominations were made by the Council itself in accordance with the Rules, and it is in a good position to select as candidates those who are likely to serve their profession well. Indeed, the names submitted inspire confidence in the ability of the Council to do so. Nevertheless we believe that members as a whole should not regard a *pro forma* nomination for election as an Ordinary Member of Council as equivalent to the election itself. It is open to any ten Members or Associate Members, respectively, to nominate (under Rule 50) alternative candidates not later than June 21st, and to take advantage of this rule cannot be construed as indicating any lack of confidence in or disloyalty towards the Council. The invoking of this rule not only saves the election itself from being a useless formality, but also tends to arouse the interest of private members in the work of the Institution.

Adams of Niagara

IN the minds of some of our readers of maturer years interesting memories will be revived by the death of Edward Dean Adams, which quite recently occurred in New York. The discussions that gathered around the project for the utilisation of the Niagara Falls, and the part contributed by eminent British scientists and engineers, are recalled by the statement in the *Electrical World* that it was Adams who organised " a group of scientists known as the International Niagara Commission," headed by Lord Kelvin. In 1892 he became prominently associated with electricity development in the States and was president of the Niagara Development Company formed to promote the hydro-electric plant at the Falls, which was completed in 1895. The Kelvin Commission endorsed Adams's project, but not his proposal to use alternating current. It was with the aid of George Westinghouse that the plan became an actual achievement. The pages of the ELECTRICAL REVIEW for 1895 and preceding years contained much critical and entertaining comment concerning some technical aspects of the undertaking. Not all American men of eminence shuffle off this mortal coil in the years of their juvenility. Adams, for instance, had reached his 85th year, and died as the result of an automobile accident; and he was planning a visit to T. A. Edison, his junior by a year!

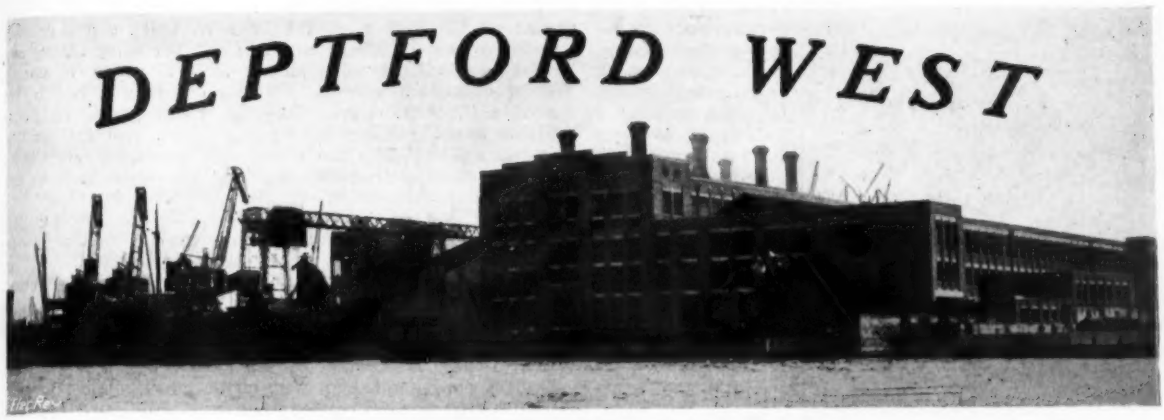
Non-ferrous Metals Research

INCORPORATED in January, 1920, under the scheme of H.M. Department of Scientific and Industrial Research, the British Non-ferrous Metals Research Association was founded with the dual object of serving as an intelligence bureau and of undertaking research requiring prolonged investigation. At first difficulty was experienced even in obtaining the minimum industrial subscription of £2,500 necessary to secure the Government grant, but the turning point was happily reached in 1922, since when the income has been raised by Government grant and other revenue to £24,000 in 1930. Looking back, it has been clearly demonstrated that one of the major requirements of the establishment of a liaison between science and industry is the training of staff of a type hitherto not readily available. Particularly in the " intelligence " and " development " sections of the work, men are needed who possess a dual outlook, and the strength of the Association has in no small measure resulted from the mobilisation of permanent staff which has gradually accumulated such experience, and by successful effort has enhanced its potential service to the whole organisation. The completion of ten years' valuable work has been marked by the opening of central headquarters in London, and its resources have been considerably strengthened thereby. In modestly selecting equipment nothing has been purchased of which immediate and direct use is not certain, so that many important requirements remain to be satisfied, but for the moment they depend on the generosity of individual donors and the progress of the headquarters' fund, the worthiness of which is self-evident to those who assess the results already obtained at their true value.

Next Week's Convention

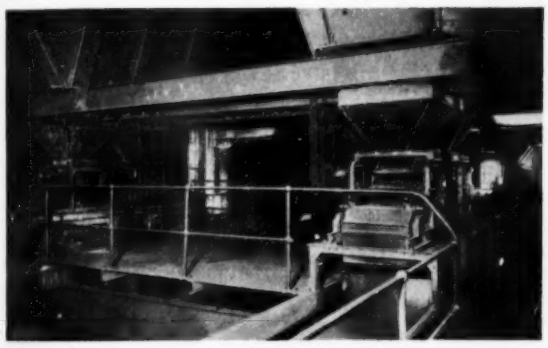
As this issue of the REVIEW reaches the hands of our readers many of them will be putting the final touch to arrangements for their visit to Scarborough for the annual convention of the I.M.E.A. From the programme and particulars of events and exhibits printed on another page, it is obvious that, humanly speaking, everything has been done to ensure success at every point. In accordance with our usual custom we shall mark the occasion with the issue of our Special Convention Number, containing many important signed articles and other special features.

DEPTFORD WEST



Very high thermal efficiency, sandwich firing with 20% coke breeze, and marked cleanliness throughout render this "selected" station of outstanding interest

IT is particularly pleasing to know that what is, practically speaking, the site of the historic plant laid out by the late Dr. S. Z. de Ferranti at Deptford (East) now serves for a station that can claim to be among those that have made the greatest advance in the race for thermal efficiency among the public electricity supply undertakings in this country. At the end of the last year the pride of place was held by the Kearsley station of the Lancashire Electric Power Co.,



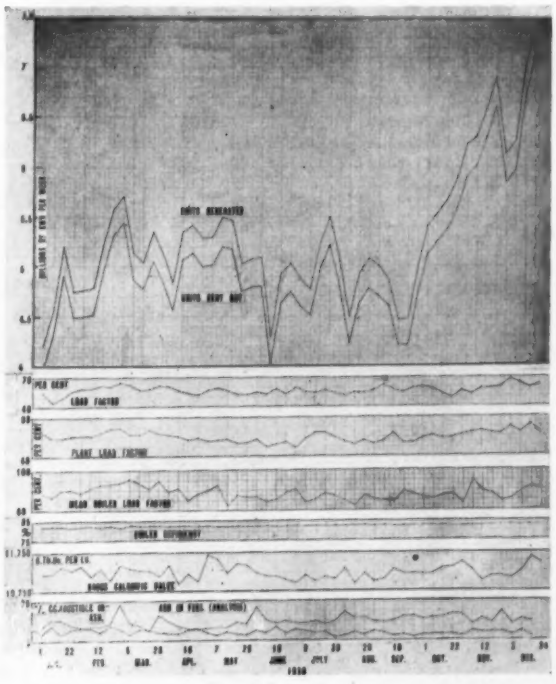
Automatic Weighers under Bunkers

with an efficiency of 24.36 per cent. For the first quarter of this year the figure for Deptford West was 24 per cent. The development of the two Deptford stations side by side is in itself a very fine tribute to Ferranti's judgment; it leaves no room for argument as to the fundamental soundness of the pioneer's choice of site.

The area of the site of the two stations is now about eight acres, presenting to the River Thames a frontage of 500 ft. Great advantage is obtained in having coal- and ash-handling plant, stores, repair shops, offices, &c., common to the two power houses. The newer works was designed to serve, at any rate for the first few years of its life, pending the building of the larger station at Battersea, as a base-load installation, and the present main generating plant capacity is 125,000 kW. Extensions at present in hand will bring the station capacity up to 165,000 kW. The design provides for an ultimate capacity of 200,000 kW. The output of Deptford West is now about 1,000,000 kWh per day, and it serves the common network of the Power Co. in conjunction with the other four generating stations of the organisation, namely, Bow, Deptford (East), Grove Road, and Willesden. The total plant capacity of the whole system is 595,580 kW, and the load is regulated from the main control room at Ergon House, Horseferry Road (ELECTRICAL REVIEW, December 29th, 1929, p. 1110).

The station is stoker fired, employing coal of about 12,000 B.th.u. and coke breeze of something like 9,000 B.th.u. on the sandwich system, the proportion of coke to the total fuel being 20 per cent. The weekly consumption of fuel (coal and coke) is in the neighbourhood of 4,000 tons. The overall efficiency of the station per kWh generated is 24 per cent., and per kWh sold 23 per cent. The boiler efficiency averages 82.5 per cent. The station load factor is about 60 per cent., the boiler load factor 90 per cent., and the generating-plant load factor 70 per cent. The total capital cost of the first section of the works, including land and the frequency changer necessary to tie the 50-cycle plant with the 25-period sections of the system, is £2,339,600, or £18.72 per kW installed. The estimated cost of the buildings and plant for the second section, now under construction, would bring the total cost of the completed station up to £3,089,600, or £15.84 per kW installed. The plant is laid out for operation on the unit system, each machine being self-contained from the steam-raising to the circulating-water equipment, and also so that each set can be tested individually from one centralised testing outfit. Consideration was given to the possible use of pulverised fuel, but the possibility of nuisance due to emission of dust from the chimneys was sufficiently serious to rule out that system. A further factor which influenced the decision was the proximity of the Greenwich Observatory.

The buildings are of steel and brick construction with reinforced-concrete floors and slightly inclined reinforced-concrete roofs. The building work was carried out by the Foundation Co., Ltd., and the structural steelwork by Sir Wm. Arrol & Co., Ltd. A coaling jetty 300 ft. long by 40 ft. wide, carried on concrete-filled cylinders, is placed parallel to and about 50 ft. from the river wall. The jetty is designed to receive sea-going steamers of up to 4,000 tons loading capacity, and carries three 7-ton travelling cranes which unload the coal from the vessels by grabs and discharge it into hoppers feeding two belt conveyors. The two receiving hoppers are of the travelling type, each serving one of the belts. The jetty belt systems have a total capacity of 300 tons per hour and feed either to a 40,000-ton common store or direct to either of the two stations *via* a distributing tower fed by a single conveyor. Coke breeze is also received at the jetty and is unloaded and handled in similar fashion, except that it is delivered direct to separate bunkers over the boilers. A Westminster automatic weighing machine is arranged in each of the branch belts serving the power



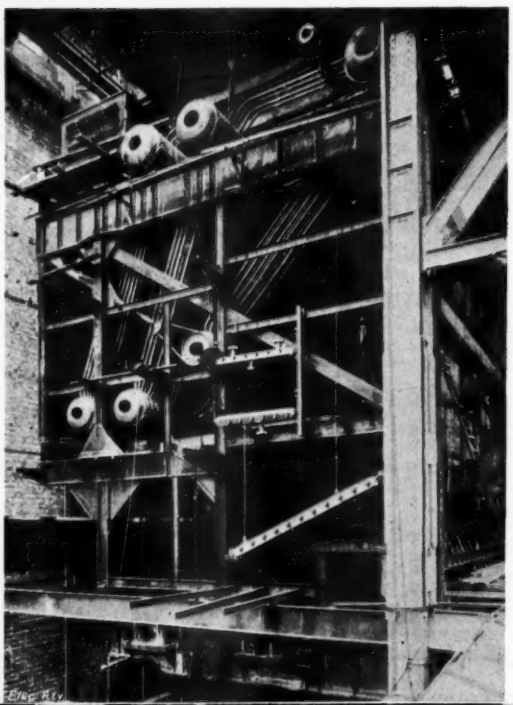
Some of the Station Operation Curves—1930

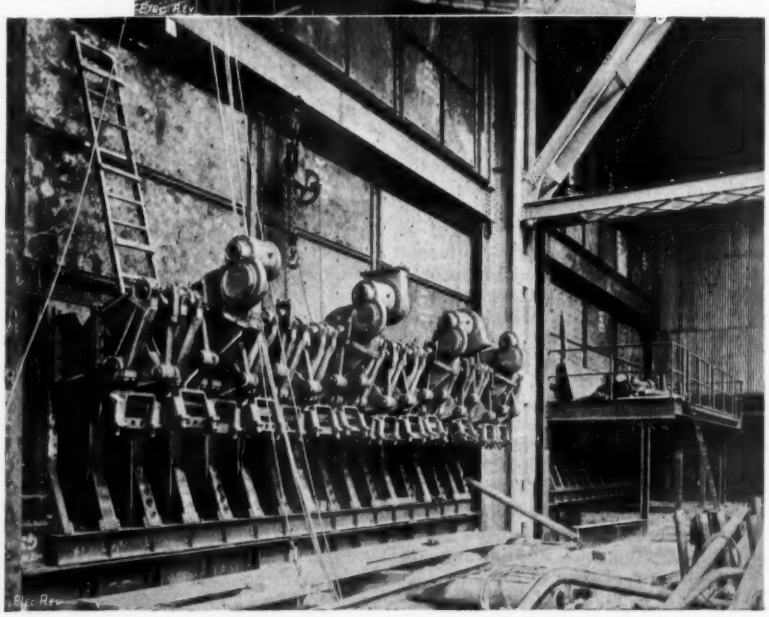
Taylor Stoker in Combustion Chamber at Deptford (East)

porter-bridge equipment. The conveyor equipment was supplied by Naylor Bros., Ltd.

The boiler house runs parallel with the turbine room and is laid out with two rows of steam-generating units with a central firing aisle and overhead bunkers. Near the centre of the building, lengthwise, is a space accommodating water tanks, switchgear, &c., over which the bunkers do not extend, thus affording facilities for natural lighting, ventilation, and hoisting equipment. The fuel bunkers are arranged for self trimming and with separating diaphragms for coal and coke. The compartments are lined with reinforced-concrete at the sides and blue bricks at the bottoms. The total capacity of the bunkers is 5,000 tons. On each hopper is an "Avery" machine weighing coal and coke separately. The present installed capacity of the boiler house is 1,000,000 lb. per hr. n.e.r., and 1,280,000 lb. per hr. m.c.r. Four additional boilers are in the course of erection, which will bring the capacity up to 1,640,000 n.e.r. and 2,080,000 m.c.r. There are six C.T.M. Babcock and Wilcox boilers on the west side of the building, four rated at 75,000/95,000 lb. per hr. and two at 100,000/130,000 lb. per hr. On the opposite side there are six tri-drum Stirling boilers, four of 75,000/95,000 lb. per hr. capacity, and two rated at 100,000/130,000 lb. per hr. The four new boilers will have an output each of 160,000/200,000 lb. per hr. They are being supplied and constructed by John Thompson Water Tube Boilers, Ltd. All the existing boilers have interdeck superheaters and "Usco" plate-type air heaters. The B. and W. boilers have "Contraflo" economisers, and the Stirling units are served by integral economisers. The Thompson boilers are of the "Beta" six-drum type and are fitted with interdeck superheaters, "Eco" gilled-type economisers, and "Usco" plate air heaters. Water-cooled side and rear walls are provided on all the B. & W. units, and w.c. side walls only on the Stirling equipments. The firing arches are of the suspended type in all but three instances, in which water cooling is employed. With the exception of two retort stokers, B. & W. compartment-type chain grates are employed throughout for the existing plant. All the stoker motors are housed in the boiler-house basement and drive through chain and sprocket gearing. The retort stokers are of the Erith-Roe make. It is interesting to note that retort stokers are also being employed for the new boilers, three by Taylor Stoker Co., Ltd., after trial of similar equipment at Deptford (East), and one Erith-Roe stoker.

The Taylor stoker is similar in principle to the Erith-Roe apparatus, but it is opportune at this stage to publish a brief description. The grate consists of alternate rows of retorts and tuyeres, spaced equally across the stoker from side to side. Each retort of the stoker has a number of pushers which form the bottom of the retort, while the sides of the retort are formed by the tuyeres and their supporting side plates. The air for combustion is admitted to the fuel through the tuyeres. Each set of pushers is controlled by pusher rods, which in turn are actuated by the driving mechanism. The travel of the individual pushers can be altered from the stoker front at the will of the operator, thus assuring complete control of the fuel throughout the entire furnace. The stoker bed is inclined just sufficiently to permit the assistance of gravity in the advance of the fuel. Between the last row of tuyeres and the crusher pit is an extension grate consisting of heavy cast-iron perforated plates with a travel similar to that of the pushers. Air is supplied to this grate at a lower pressure than what is maintained under the tuyeres, so as to meet the decreased rate of combustion at this point. Finally, the ashes and clinker pass to the crusher pit, where they remain for a considerable time exposed to the radiant heat of the furnace, while air at reduced pressure is forced through the pit and extracts the remaining carbon. The pit gradually increases in width towards the crusher rolls, which break up the clinker and fix the rate of discharge to the ash-handling plant. The fuel is fed from the hopper to the bed by rams actuated by mechanism at the stoker front. There are 16 retorts feeding each of the Thompson boilers, a small chute from the main hopper right across the front of the boiler feeding each plunger. The feeding rams are arranged in three sections with two drives, the centre portion being so arranged that it can be served by either drive, which consists of a variable-speed motor operating through a two-speed gear box.



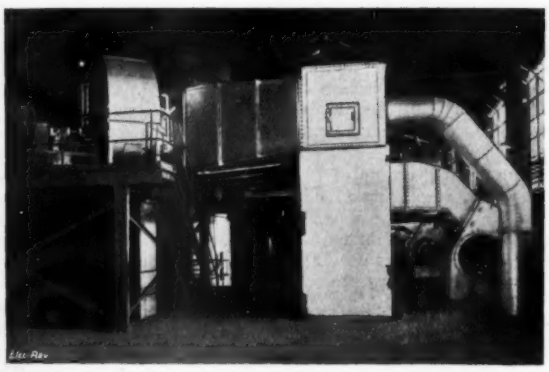


New Retort-fired Boilers under Construction, Side and Front

The boiler-house steaming conditions are 375 lb. per sq. in. and 780 deg. F. Air is supplied to the grates at 230-250 deg. F., and the final flue-gas temperature is 230-240 deg. F. Each existing boiler is equipped with one f.d. fan and one i.d. fan, and the two new boilers will be equipped with two f.d. and two i.d. fans. All the fans are housed on one floor

with the air heaters. The f.d. fans are driven by a.c., s.c. motors, one through a hydraulic coupling for speed variation. The i.d. fans are driven by pole-changing motors affording two-speed variation. The flue gases are discharged into Davidson cyclone grit separators. Normally smoke observers on the roof of the station keep the staff in touch with the stack conditions, but at present an interesting automatic smoke-indication equipment is being tried out. A tube arranged in the flue has a pyrometer at one end and a lamp at the other. The pyrometer is connected to electrical indicating and recording instruments calibrated in density of smoke.

The ash from the backs of the stokers falls automatically into an inclined water trough which discharges into an 150-ton water pit. The ashes, of course, settle, and the water is pumped back to the high level of the ash race, where it is given a certain velocity, but the mixture is conveyed down the race mainly under the influence of gravity. The ashes are grabbed from the pit periodically and treated in a grading plant of the revolving-drum type before sale to manufacturers of breeze blocks, &c. An unusual feature is the handling of the riddlings, of which there is an abnormal amount due to the use of coke breeze. From hoppers in the basement beneath the ash-pit chambers the riddlings fall into a pneumatic system and are removed direct to the fuel bunkers. The pneumatic equipment by Pneumatic Conveyance and Extraction (1929), Ltd., is also used for soot extraction at the usual points on the boiler plant. Centrally arranged in the boiler house are a large-scale critical steam-pressure indicator, a load indicator and steam- and feed-pressure instruments, in addition to a "Synchronome" clock. The boiler plant as a whole is rendered attractive by



I.D. and F.D. Fans and Air Heaters

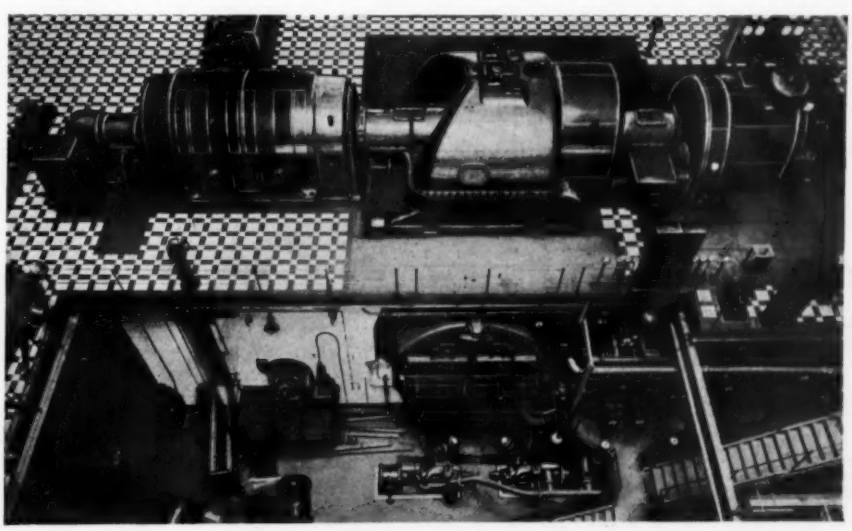
the all-aluminium finish, coupled with the colour scheme for the pipework. The steam from the boilers is passed to a system of interconnected receivers, from which it is fed to the turbines. Each boiler instrument panel is equipped with a steam- and air-flow indicator and recorder, draught gauges, steam-pressure gauges for the boiler, superheater and economiser, temperature recorders for the outlet gas and steam, and an air-to-grate thermometer. In connection with the extension, a gas-washing plant developed by the London Power Co. is being installed (ELECTRICAL REVIEW, October 10th, 1930, p. 587). Each of the boilers is served by four chutes, two for coal and two for coke.

The turbine room is at present equipped with four main turbo-alternator sets, two of 27,500 kW, m.c.r., manufactured by British Thomson-Houston Co., Ltd., and two 35,000-kW (m.c.r.) Metropolitan-Vickers machines. A further 35,000-kW M.V. machine is in the course of erection. All the turbines are of the twin-cylinder type and run at 1,500 r.p.m. There are also two 2,500-kW m.c.r. B.T.-H. house-service sets. The turbine-room steam conditions are 350 lb. per sq. in. and 750 deg. F. at a standard vacuum of 29 in. and a circulating-water inlet temperature of 58 deg. F. Each turbo set is equipped with two sets of three-stage steam air ejectors. Two- and three-stage steam bleeding is provided on smaller and larger main turbines, respectively, for feed heating and evaporating purposes, the evaporator, interposed in the machine heating system, providing 4 per cent. make-up with 100 per cent. stand-by. The feed heaters on the B.T.-H. sets were supplied by Richardson, Westgarth, Ltd., and those on the M.V. machines are of the same make as the sets. The condensers are of all-steel make, riveted and welded, with 1-in. diameter tubes. The whole of the condensing plant was supplied by Richardsons, Westgarth.

The Ash-receiving Pit

The circulating water is received from the river *via* two 11-ft. tunnels constructed from the river bed to land shafts. Each tunnel is divided horizontally by a diaphragm, and the inlet water is drawn through the lower section and the discharge is passed through the top portion. The tunnels are so placed as to be served by an 8-ft. head of water at the lowest recorded tide. From the land shafts two 8-ft. diameter cast-iron, concrete-lined inlet tunnels under the turbine-room basement connect to the circulating-water pumps, there being two pumps to each set, one on each suction tunnel. Under normal conditions each pump will serve the full economic load of the set. Discharging against a 34-ft. head, the capacity of each pump on the smaller main sets is 1,000,000 gal. per hour, and that of each pump for the larger sets is 1,250,000 gal. per hour. A "Deptford" rotary strainer is arranged at the discharge of each c.w. pump, and the only other straining that has proved necessary is by coarse grids in the land shafts. The "Deptford" strainer is of the perforated-drum type, the water entering at the periphery and leaving longitudinally at the centre. The discharge from the condensers is effected through two 66-in. bus mains connected to the top sections of the river tunnels. The system is designed to afford the advantage of syphonic action. There is also a 24-in. main coupler on the inlet side of the condensing plant, by means of which considerable economies in pumping power are possible.

The feed system is totally enclosed, the condensate, after leaving the condensers and l.p. heaters, passing direct to the feed pumps and then through the h.p. heaters to the boiler feed mains. The stability of the lines between the extraction and feed pumps is maintained by automatic valves, which pass the excess water either to a surge tank or into the condensers, where it is automatically deaerated. All the c.w. valves are motor operated from convenient points. No separate deaerators are employed. In the feed cycle the



One of the 35,000-kW Turbo-alternator Sets

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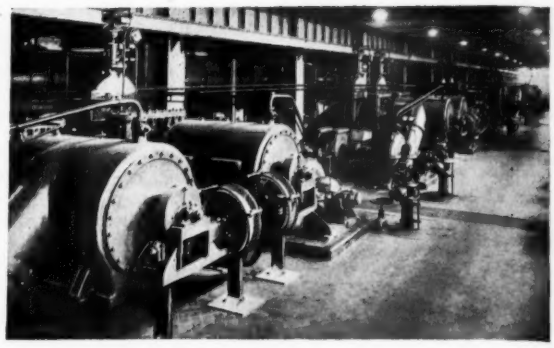
temperature of the water is raised from the condensate temperature of 74 deg. F. to 260 deg. F. at the economiser inlets. The extraction and feed pumps are all in duplicate, and the stand-by feed pumps are steam driven. The feed pumps were supplied by Mather & Platt, Ltd.

The main alternators all generate at 6,600 V, 3-phase, 50 cycles, but each machine is solidly coupled to its own bank of three single-phase M.V. transformers, 11,000 or 14,000 kVA, according to the size of the alternator, which raise the generating pressure to 22,000 V, at which voltage all the main switching is carried out. The transformers are housed in cubicles below the bus-bar floor on the outside of the building. All the alternators are air cooled on the closed system equipped with thermostatic alarms and emergency dampers. For the larger sets supplementary fans, in addition to the rotor fans, are used at the higher loadings. The B.T.-H. machines are equipped with cascaded exciters, and the M.V. machines with self-exciting machines. The house alternators generate at 440 V, 3-phase, 50 cycles. The frequency changer referred to early in this article, which was described in the ELECTRICAL REVIEW of May 15th, 1931, p. 830, forms part of the turbine-room equipment. It has a m.c.r. rating of 30,000 kW and is designed to have a high pull-out torque,

Main Board and Operator's Desk in Control Room

enabling momentary peaks of the order of 100,000 kW to be dealt with. It is of M.V. design and make, and is claimed to be the largest machine of its kind in this country. Included in the engine-room equipment is also a testing alternator set by the Electric Construction Co., Ltd., which, with transformers, can be used for tests up to 40,000 V.

The main switchgear is of the B.T.-H. cellular type with phase separation throughout. The bus-bars are in duplicate and divided into three sections, with provision for solid coupling of the sections or connection through reactors. The feeder and generator breakers are all in duplicate; they are of the motor-operated, explosion-pot type, and have a rupturing capacity of 1,500,000 kVA. All the switchgear is safeguarded by interlocks operated by Castelle keys. A test bus-bar connected to the testing-alternator set runs the whole length of the main bus-bars.



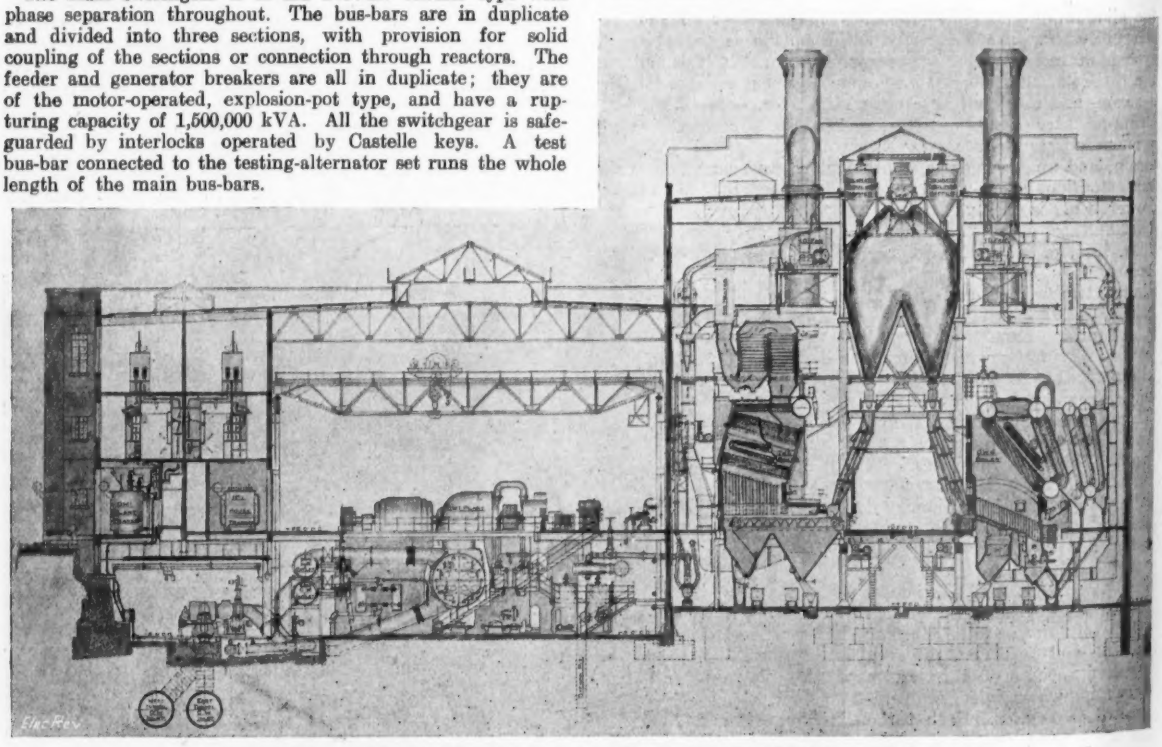
C.W. Pumps and "Deptford" Rotary Strainers

The control room is laid out with a U-shape board with the operators' desk at a point of vantage in the centre. The panels are equipped for the remote control of the turbo. sets and frequency changer, and are surmounted with the usual mimic diagram of the system equipped with circuit indicators which operate automatically with the actual switchgear. Telegraphic and loud-speaking telephonic communication is provided to all the sets, the boiler house and the works power switchboard, and also to the Horseferry Road control centre.

The station switchboard, situated in the turbine room, serves for the whole of the works auxiliaries. It is equipped with two sets of bus-bars, one being fed from the house-service machine and the other from the main 22-kV bars through three 2,500-kVA house transformers with reactors in series. The bus-bars are divided into three sections, and each section of the house-transformer bars is supplied from the corresponding section of the main 22-kV bars. The three sections of this board can be tied through sectionalising switches, and couplers enable the house-service set bars to be paralleled with the house transformer bars.

The original design of Deptford (West) and the first part of the work were carried out under the direction of the late Sir Alex. B. W. Kennedy and Mr. G. W. Partridge, joint engineers to the London Power Co. prior to the appointment of Dr. S. L. Pearce, C.B.E., as engineer-in-chief, who has been responsible for the completion of the work.

We are indebted to Dr. Pearce for permission to publish this article and to visit the work and take photographs, and to Mr. H. P. Gaze, chief generating engineer to the Power Company, and Mr. J. A. T. Garrard, station superintendent, Deptford West, for their assistance in the collection of the above information.



Section Through Turbine House and Boiler Room Depicting Plant Lay-out

Electro-Metallurgical Deposition

SINCE about the year 1924 the development of electro-deposition plant for extraction and recovery of metals in this country has made increasing headway.

The electrolytic system appeals more strongly to industrial concerns who handle complex materials which do not lend themselves to simple reclamation. At the outset the reactions which the current involves must be understood *in toto*, since any lack of knowledge in this respect would literally disorganise the whole process.

Accepted theories in this work are of the greatest importance, and should not be confused with what are regarded as empty hypotheses.

Practical Points on Polarisation

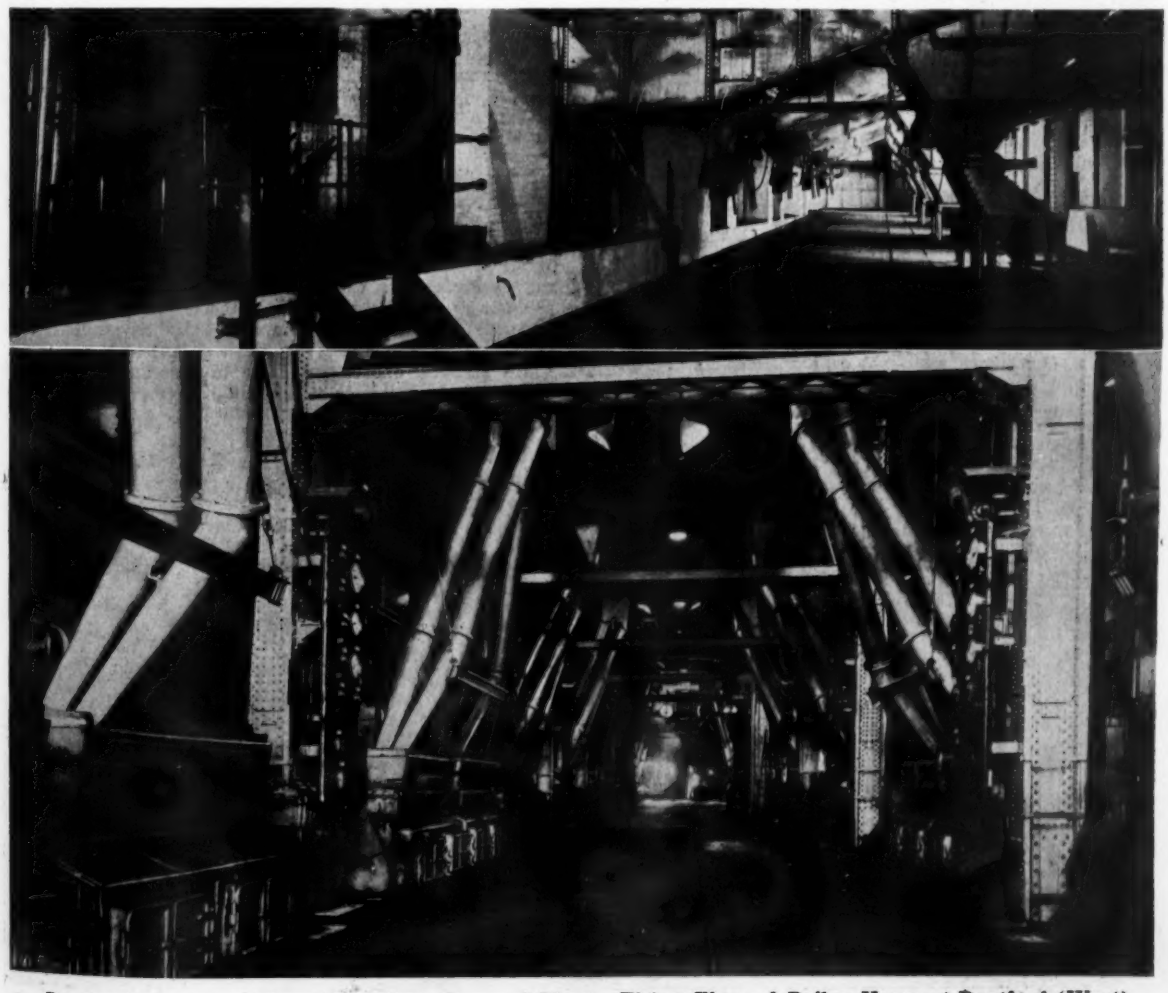
To ascertain the polarisation, that is, the polarisation of both anode and cathode, the difference of potential between electrode and solution must be found. This is ascertained by setting up an electrolytic cell with a standard electrode which shows the drop in potential. In electro-deposition works these figures are made out in graphs termed current-density electrode-potential curves, and show the amount of polarisation in an electrolyte at different current densities.

In electrolysis, polarisation, of course, increases the voltage required. Too great polarisation may cause a new electrode process of undesirable nature to operate. What is known as concentration polarisation is that due to concentration around the electrodes, which, although usually small, increases with increasing current density. Increased temperature and stirring increase the rate of of diffusion and consequently tend to reduce concentration polarisation. If in practice the polarisation is not greater than that to be expected on the basis of simple concentration polarisation, the process is termed "reversible," and if greater than can be accounted for in this manner is to some extent "irreversible."

Concentration polarisation may occur in the electrode itself. If no compensating process can rectify the impoverishment of that constituent of the alloy electrode by dissolving out, the potential will rise until some other electrode process can occur.

Another instance is where at a cathode a substance is produced differing from the material of the electrode, but soluble in it. Polarisation here will occur due to the accumulation of such substance in layers on the electrode until some compensating process can remove it as fast as it is formed. The only other way polarisation can occur is due to some interfering substance. As an example, with a film of a non-conductor partially covering the electrode surface, the current density at the remaining free positions of the surface

Auxiliary Board and Reactor Cells at Deptford (West)

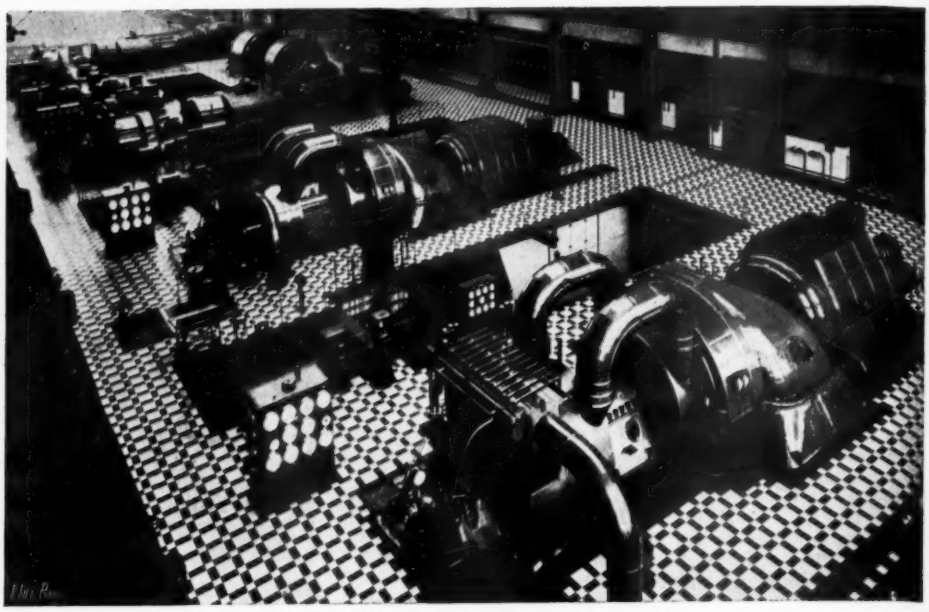


Basement, showing Ash and Riddlings Removal Plant; Firing Floor of Boiler House at Deptford (West)

will increase if the same total current density is maintained.

If the film covers the electrode surface completely, so that the electrolyte ions cannot come in contact with it, the polarisation must rise until a change is made. That is, the rise will continue until separate electrons can pass across the film at sufficient rate to maintain the current density, with the result that there is the possibility of enormous polarisation losses.

Heat assists the development of chemical compensating processes, besides increasing the rate of diffusion and changing local concentration in the electrode. Depolarisers both prevent polarisation locally and also dissolve any films, thus rendering the process active again.



The Turbine Room at Deptford (West)

In the deposition of metals from ores and other metallurgical products, the tanks employed are usually connected in series with one another and the dynamo. With the exception of some rapid tin depositions, the voltage drop is seldom over six volts. When trouble arises in the working of the process, means are provided for cutting out any tank when desired.

The alternative (which is seldom advocated) consists of using shorter series in parallel and a dynamo of lower voltage and higher amperage, which means more costly working. The most frequent use of the latter system is with complex cells, where irregularities of operation are probable. When the process is such that circulation is necessary, the units are usually small, so as to necessitate a change of flow.

It is customary to have a large number of small anodes connected in parallel in each tank alternating with a large number of small cathodes similarly connected. By this means the necessary large surface is exposed to the liquid. The bath voltage drop is made to fluctuate by reversible and irreversible effects, as is also the drop at both anolyte and catholyte, all of which are decreased by a rise of temperature.

Reversible effects are unaffected by current density, which increases irreversible effects with current density. Analyte and catholyte vary directly with current density. The leads and terminals only exert a very slight effect. The resistance of a cell is always less than that calculated, since the path of the current is curved, *i.e.*, if the liquid between the electrodes alone conducts.

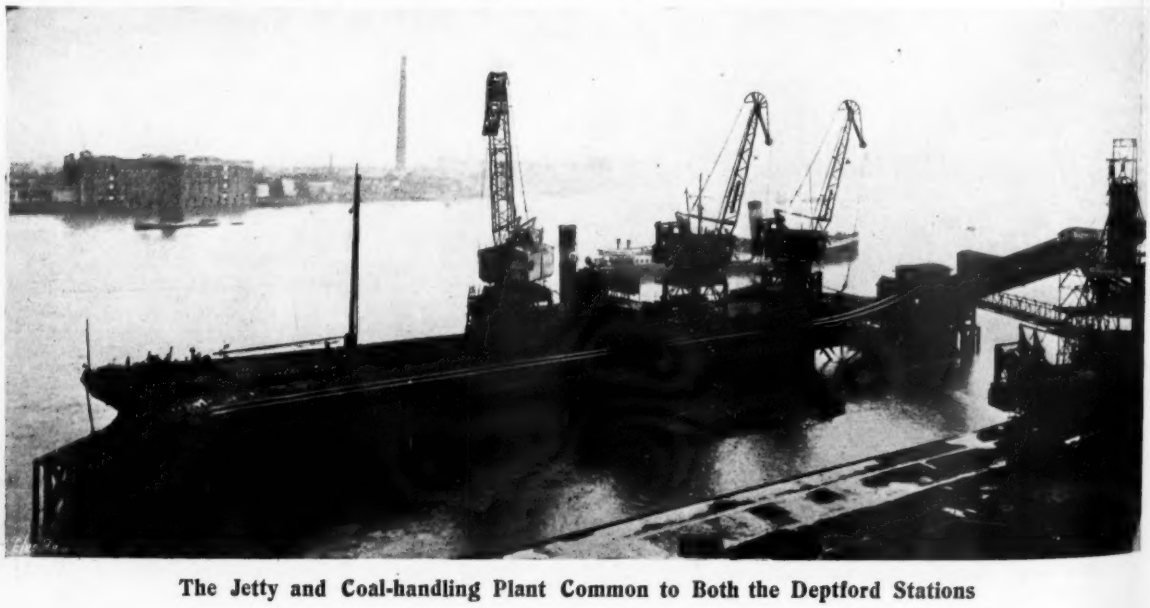
Size and Substance of Electrodes

Current seldom enters and leaves an electrode uniformly. It is usually greater at the edges, and hence causes growths. For this reason it is inadvisable to use too small electrodes, as a fraction may be working at an increased current density which can so markedly affect the results. Defective contacts have been known to cause losses of 20 per cent. of the total voltage across the tank. Losses are most noticeable where contacts have to be constantly replaced. To ensure economy in consumption of electricity, and also to provide sound deposits, it is necessary to establish a low hydrogen over-voltage

In practice, the cathodes are usually made of iron for alkaline solutions, and graphite for acids. When permissible, the cathode starting sheet is often made of the pure metal to be deposited, so that all may be melted up at once when the deposition is completed. Other cathodes are made from metals where stripping will be simplest and where no action will be exerted on the texture or regularity of growth. An exception to this is in the deposition of base metals such as zinc, where the cathode material should be of high hydrogen over-voltage.

Anodes, besides being good conductors, should not be attacked and should have low oxygen or chlorine over-voltage.

Carbon and graphite anodes of good quality should ring when struck; as a rule, they are quite efficient so long as oxygen evolution is excluded. When this trouble commences the anodes burn away and foul the electrolyte. To protect this, the anodes should be impregnated with a solution of a cobalt salt, which assists in the resistance to oxidisation. Since graphite anodes are liable to be attacked, they are usually made in pieces which can be removed and scraped when necessary.



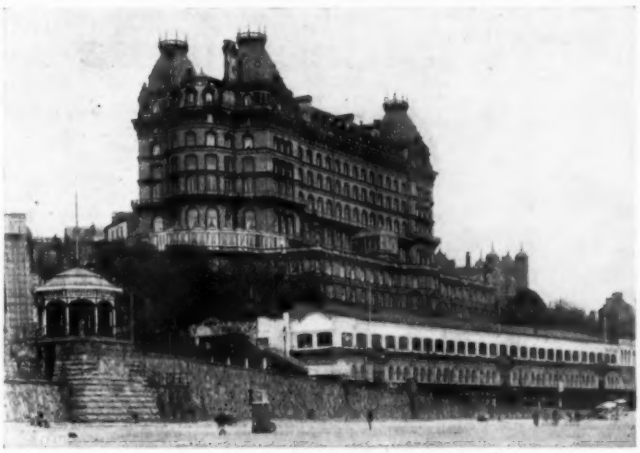
The Jetty and Coal-handling Plant Common to Both the Deptford Stations

The Scarborough Convention

Next week's activities of the Incorporated Municipal Electrical Association

GIVEN fine weather, of course, one can hardly imagine a more agreeable place than Scarborough for the Incorporated Municipal Electrical Association to hold its 36th annual Convention, which is to open on Monday next with headquarters at the Grand Hotel, overlooking the south bay and adjoining the Spa entrance. The accommodation is good as regards hotels and also for both the business activities and the social functions of the Association, while the amenities of the town and district are such that members will not find their leisure moments dull.

Of outstanding interest in the town is the Spa, where the business meetings and some of the social functions are to be held. For centuries this has been famous as a place of social resort, and its make-up, promenades, terraces, concert halls, cafés, and ballroom spell magnificence. Among the other buildings which will offer accommodation to the Convention is Olympia, a fine structure on the front which will provide display spaces for the exhibits of some 40 manufacturers, &c. Because of the excellent results obtained by the Scarborough electricity undertaking in floodlighting the castle and the waterfall and pagoda at Peasholm Lake, these features will no doubt prove to be particularly interesting attractions to the members.



Grand Hotel, Scarborough—I.M.E.A. Headquarters

Olympia where the Exhibition will be held

The Convention Office at the Grand Hotel will be open on Monday from 10 a.m. to 1 p.m. and 2.30 p.m. to 9 p.m., and on each day during the remainder of the Convention from 9.15 a.m. to 1 p.m. and 2.30 p.m. to 6.30 p.m., with the exception of from 9.15 a.m. to noon on Tuesday, when it will be established at the entrance to the Spa Ballroom. After June 12th all communications to the secretary to the I.M.E.A. should be sent to the Convention Office, Grand Hotel, Scarborough.

The papers to be presented during the week will be read in abstract and afterwards published in full, with the discussions thereon, in the annual proceedings of the Association. Badges will be issued to members during office hours on the first day, and at 8.15 to 8.45 p.m. there will be a reception at the Grand Hotel by the president, Mr. Arthur J. Fuller, M.I.E.E., borough electrical and consulting engineer, Fulham, supported by the Mayor of Fulham, Alderman W. J. Waldron, J.P. The reception will be followed by dancing and music in the ballroom, simultaneously with a concert in the lounge. At 9.30 a.m. on Tuesday the members of the council will assemble in a room adjoining the Spa Ballroom, and at 10 o'clock the proceedings will commence with a civic welcome by the Mayor of Scarborough, Alderman J. W. Butler, J.P. This will be followed by the presidential address of Mr. Fuller, at the conclusion of which the ladies will be invited to meet Mrs. Fuller at the Children's Corner Café at the Spa for coffee. The presidential address will be followed by a paper by Mr. E. E. Hoadley, M.I.E.E., borough electrical engineer, Maidstone, on "The Cost of Home Service by Electricity." At 12.30 p.m. members will assemble at the Spa for the official photograph, copies of which may be obtained from Mr. H. Walker, 35a, St. Thomas Street, Scarborough. In the afternoon there will be the official visit to the exhibition at 2.30 p.m., and at 4.30 p.m. members of A.M.E.E. will hold a meeting at the Grand Hotel. In the evening, 8.15 to 8.45, the Mayor and Mayoress of Scarborough will hold a reception in the Spa Ballroom.

Wednesday's activities will commence at 10 a.m. with the presentation of a paper by Mr. Isaac Dixon, Liverpool, on "The Assessment of Undertakings in Relation to Local Rates." At 2.15 p.m. there will be a coach trip to Whitby, *via* Thornton-le-Dale, Pickering, and the Goathland Moors, starting from the Grand Hotel; tickets 7s. 6d. each.

On Thursday the proceedings will commence at 10 a.m. with a paper by Mr. A. Nichols Moore, M.I.E.E., borough electrical and tramway engineer, Newport, Mon., hon. treasurer, I.M.E.A., on "The Future Development of Electricity Distribution in Great Britain." A second paper that day on "The Value of the Lighting Load to Supply Undertakings" will be presented at 2.30 p.m. by Mr. C. W. Sully, director, Electric Lamp Manufacturers' Association of Great Britain, Ltd. In the evening the Association's annual dinner will be held at the Grand Hotel at 6.45 for 7.15 p.m.; tickets 12s. 6d. per head, exclusive of wines. After dinner there will be dancing.

Thursday will also be "Women's Day," for which a special programme has been drawn up by the Electrical Association for Women. In addition to items in the general programme, this will include a luncheon at the Royal Hotel at 1 p.m. (tickets 2s. 9d. each), a visit to the exhibition at 2.30 p.m., and tea at 4 p.m. at the Medical Baths by kindness of the Scarborough Electricity Committee.

On Friday there will be a council meeting at 9.30 a.m., followed by the Association's annual general meeting at 10 a.m.

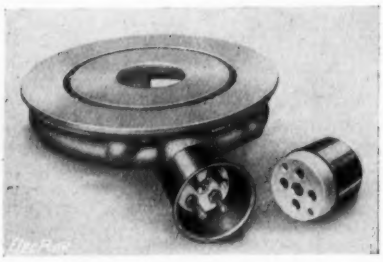
Visits to the electricity works of the Scarborough Corporation and to the Scarborough Waterworks, at Irton, have been arranged for the last day of the Convention, Saturday.

Those who will attend the Convention are reminded that there will be a golf competition once again, from Saturday, June 13th, until 5 p.m. the following Thursday for the "Dennis" trophy, all the entrance fees for which will be contributed to the benevolent fund of the Institution of Electrical Engineers. It is hoped that as many as possible will play. Those who are unable to play might send their entrance fees (2s. 6d.) to Mr. R. N. Torpy, at The Manor Private Hotel, Scarborough.

Spa Ballroom where the Business Meetings will be held

What to See at the I.M.E.A. Exhibition

A forecast of the principal apparatus, mainly domestic in character, to be displayed at Scarborough



Range Plate—Geo. Bray

AS usual, this year the exhibition of electrical equipment, organised by the Electrical Development Association, to be held in connection with the I.M.E.A. Convention at Scarborough next week will consist mainly of domestic apparatus. The exhibition will be held at Olympia, Marine Parade, and judging from reports received from manufacturers and others, upon which the following notes are based, the progressive interest and value of the display which has been an outstanding feature of the Conventions during the past few years is to be continued. There will be about 40 exhibitors.

Cooking Equipment

The main feature on the stand of BELLING & CO. will be a full range of attractive cookers in four sizes, three of which can be supplied as table models. In future Belling cookers will be in all-enamel finish only. The equipment includes thermometers as standard, extra large hot cupboards with doors, and well-constructed grill boxes. The oven elements are of the plug-in type, and the boiling plates are fast, reliable and efficient. A new type of metal-alloy boiler-griller plate will also be shown by this company. Mr. Chesterfield, of Fulham, has provisionally patented an attachment in the shape of an ash tray connected to a tube with a removable drawer at the bottom as a receptacle for cigar or cigarette ash and matches, and Belling & Co. will show this attached to one of their fires.

Cooker control boards by M.K. ELECTRIC, LTD., will also be shown on this stand.

DOMESTIC ELECTRIFICATION, LTD., will show two new intermediate size cookers, similar in construction to existing "Dolphin" apparatus, in addition to a range of cookers in various finishes. Fires will be displayed on this stand, many with chromium-plated reflectors and of original and pleasing design. The "Dolphin" automatic safety iron will be seen with an improved handle of "Bakelite," finger guards, thumb rest and a heel rest. The new iron described in the ELECTRICAL REVIEW of May 15th will also be on show.

This year's exhibition introduces a newcomer in the cooking field—FALK, STADELMANN & CO., LTD.,—who are placing on the market a range of British cookers of their own manufacture. The range includes four models: the "Efesca-Minor" (total loading 4,460 W), with two solid boiling plates, space for grilling, and oven cooking space of 10 in. by 12¼ in. by 13 in.; the "Media" (total loading 4,900 W), designed for 4-7 persons; the "Efesca-Major" (6,700 W), which has two solid boiling plates, space for grilling, and oven dimensions of 14¼ in. by 13¼ in. by 15½ in.; and an "Eye-level" cooker—all offered in two finishes, black and porcelain enamelled mottled grey. The "Efesca-Media" is designed to serve for the average family where space is restricted. The oven cooking space is 14 in. by 12½ in. by 13 in. deep, the grilling surface measures 7 in. by 9 in., and the boiling plate is 6 in. wide and 8 in. deep. The loadings are: oven 1,800, grill 1,500, boiling plate 1,600 W.

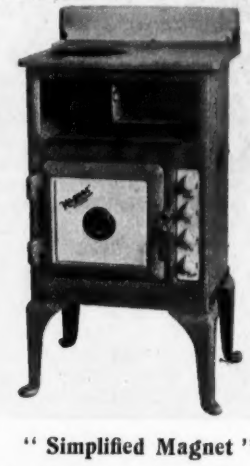
Four sizes of high-speed range plates will be shown with various types of mount suitable for different makes of cookers on the stand of GEO. BRAY & CO., LTD. These plates are fitted with the improved-pattern drip edge rings recently introduced, and have loadings of from 950 to 1,750 W. High-speed boiling plates with loadings from 650 to 1,750 W and fitted with the new-pattern rings will also be displayed, in addition to an assortment of immersion heaters, &c.

On the GENERAL ELECTRIC CO.'s stand will be shown examples of all this year's new "Magnet" models, including the thermal-storage cooker, and special prominence will be given to the three models now constituting the concern's simplified line which, it is claimed, is capable of meeting all the requirements of any electricity supply engineer. The firm's new hotplates are to be shown in various stages of manufacture. Three storage water heaters will be installed on this stand, 5- and 20-gal. rectangular wall-mounted types, and a 20-gal. model on a floor stand. Other "Magnet" domestic appliances will include refrigerators, wringing and washing machines and fires. Municipal lighting engineers will be interested in the "Viewoscope," a valuable device designed by this company to enable one to visualise illuminating effects in thoroughfares under varying conditions of spacing, height, and light intensity.

A complete range of the latest models of Hotpoint-Falco cookers which have been particularly built for hiring schemes will be exhibited by the HOTPOINT ELECTRIC APPLIANCE CO., LTD., and will include the new "Midget" cooker suitable for three or even four persons. Some of the outstanding features of these cookers are: complete hob and grill assembly divided from oven by enamelled cast-iron crown plate; rapid and reliable enclosed boiling plates positively "earthed"; grill an entirely separate unit; one-piece removable oven interior; refractory oven elements mounted complete on one frame and easily removable. There will also be exhibited on this stand "Calrod" cast-in boiling plates suitable for fitting to most of the cookers now in use. The "Hotpoint" automatic electric kettle fitted with a "Calrod" element actually immersed in the water will also be featured, as will the "Hotpoint-Maytag" electric washing machine, vacuum cleaners, &c.

A range of "Pyramid" utensils specially designed for use on electric cooking equipment to be displayed by HAGUE AND

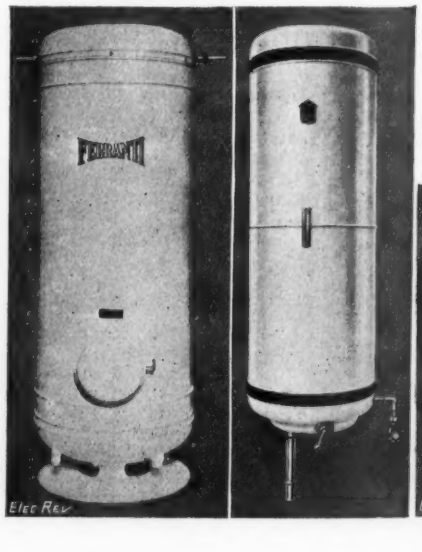
"Efesca-Media"



"Simplified Magnet"

The New Jackson

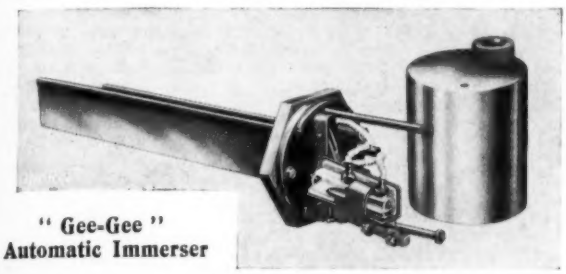
Revo with "Superspeed"



Ferranti, "Canvary" and "Inventum" Water Heaters

McKENZIE, LTD., will include a special economy steam cooker with three or four compartments arranged in tiers. The steam to each compartment can be regulated by a valve.

The production of new models of cookers by the JACKSON ELECTRIC STOVE CO., LTD., is somewhat of an event, as it is the company's policy not to introduce radical changes very often, as otherwise it is found that the customers, 90 per cent. of whom are hiring or hire-purchasing the equipment, are faced with an unnecessary amount of obsolete material. A new range of cookers to be marketed shortly by this concern will be introduced at Scarborough, but in external appearance they will be practically identical with the older models, so as to avoid any tendency for consumers to wish to make frivolous changes. It is the company's intention to produce an equivalent to practically all of its older models, but in the new design, of which the following are some features: plug-in elements; supports for grill and boiling plates and grill walls removable without tools; no dirt traps beneath hob casting; abnormally large hotcupboard space; side and bottom heat; clean oven bottom—elements outside; oven interior in one piece (non-removable); overall sizes reduced to minimum. The company will also display a range of fires, storage water heaters, &c.



" Gee-Gee " Automatic Immerser

The prominent feature of the display by the REVO ELECTRIC CO., LTD., will be a comprehensive range of cookers with a model for every size of house and family. No. 8 cooker is the company's latest achievement, and it includes eight patents among its 32 distinctive features. All the elements are of the plug-in type, with patent plug and socket connections, and the interchangeable oven elements are fitted to the sides and bottom and are so shaped that grooves in their casings perform the duties of runners for the oven trays. The totally-enclosed boiling plates are fitted with a patent locking device, and a new grill gives even distribution on half heat over the whole grill area. Immersion heaters represent a new departure for this company, which will also display fires, kettles, water heaters, tubular heaters, &c.

SADIA, LTD., will be showing their usual range of water heaters, time switches, thermostats, &c., but a novel feature will be the exhibition of four sizes of a low-pressure steam cooker. This cooking apparatus is made of very stout aluminium and works under a pressure of about 16 to 18 lb. per sq. in. When used in conjunction with one of the company's table stoves a great saving in current consumption is effected. With a maximum loading of 1,800 W, it is claimed that a complete dinner can be cooked in a quarter of the time required by an ordinary electric cooker.

J. H. TUCKER & CO., LTD., will again be devoting considerable space to the display of cooker control units, of which there are no less than 57 standardised types available. This company will also display a complete range of its latest designs in q.m. and q.b. and solid-link tumbler switches, s.p. and d.p. combined switch-sockets in semi-recessed and sunk types, and switchplates in metal and moulded " Telacite," the last item being available in ten different colours. Ironclad switch and fusegear in sizes from 10 to 100 A, service cut-outs, fuse and distribution boards will be among other features on this stand.

BRITISH ELECTRIC TRANSFORMER CO., LTD., will show their latest combination cooker, No. 800, which incorporates many new features and will supersede their No. 720 model. Other " Tricity " cookers to be shown are Nos. 770, 771, 720, 772, 773, 722, all in de luxe finish and vitreous enamelled throughout. The company will also show its " Tricity Sunray " radiators, including the " Pine-Cone " and " Pagoda " and other models for use in the home and office.

Water-heating Apparatus

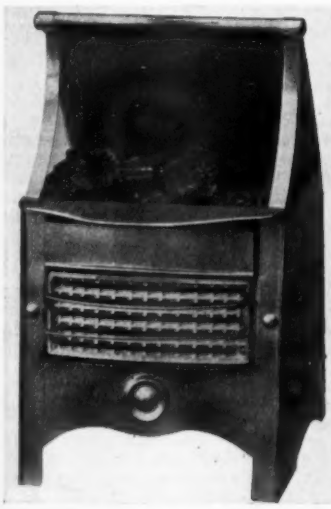
Some 1½- to 2-gal. tanks with thermostatic control and suitable for fixing over basins; a 5-gal. tank, thermostatically controlled and having a cistern with ball feed; and a 5-gal. automatic hot-water tank, thermostatically controlled and fitted with a mixing valve (hot and cold), are to be featured on the stand of ARCHIBALD LOW & SONS, LTD. This exhibit will also include a hot-water circulator which is fitted through the side of the tank, using a special flange. A thermostat fitted in a sleeve is fitted, so that the whole outfit is one unit, with two terminals for the supply cables. A steriliser, 2 ft. by 2 ft. inside, having immersion heaters with a total loading of 9 kW controlled by safety switches and the usual reciprocating control switches with fuses, &c., will also be on view.

BERRY'S ELECTRIC, LTD., will confine their exhibit chiefly to water heaters. The " Canvary " models, of sizes from 6½ gal. upwards, are now fitted with the new sleeve valve inlet, enabling water to be obtained at any temperature from scalding to cold with the possibility of leaks entirely overcome. The company will also be showing for the first time a new series of vitreous enamelled radiators of 1-kW capacity.

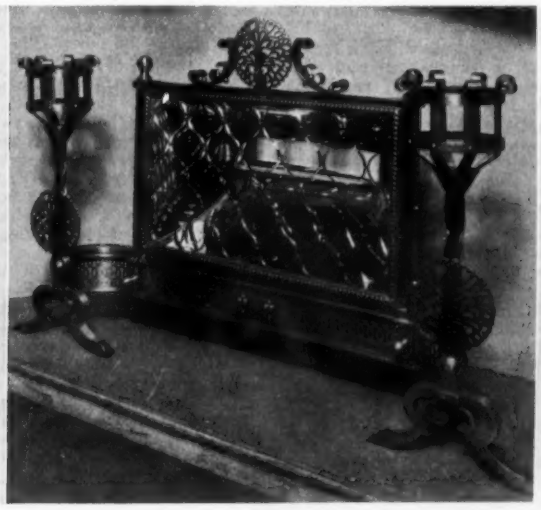
A range of new water heaters to be exhibited by CREDENDA CONDUITS CO., LTD., have an attractive white-enamel finish with scarlet and gold lining. There will be two types, the " push-through " and the self-contained model with a ball valve. The chief features are ease of cleaning, brazed copper inner bodies tested to 60 lb. water pressure, special suspension of the inner body and arrangement of the lagging, and a simple and effective anti-drip device on the push-through models. The fixing centres are to the new E.D.A. specification for British-made water heaters. A selection of the latest pattern " Creda " cookers embodying various detail improvements is also to be shown. One interesting model is the No. 8 cabinet range embodying plug-in elements throughout and a useful hot cupboard. Samples of the latest-pattern push-button re-set " Creda Protector " kettle will be shown.

On the stand of DRAKE & GORHAM WHOLESALE, LTD., will be seen three " Inventum " water-heaters: the " Under-the-Basin " cistern fitted with the " Mix-a-tap," which is described in our " New Devices " section this week; a 1½-gal. push-through heater fitted with an automatic non-drip feature and a swinging water spout; and a gravity-feed cistern the distinctive feature of which is that a cold-water feed tank, controlled by a ball tap, is incorporated under the same casing as the heating chamber, thus making a complete unit which can be connected direct to the water supply mains without the addition of pressure reducing valves, separate ball tank cisterns, non-return valves, &c.

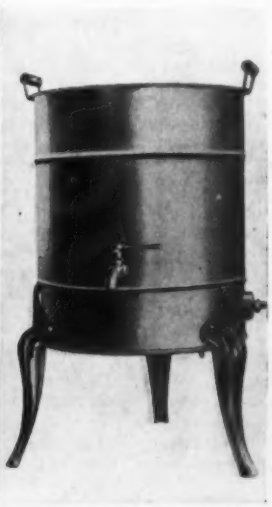
ELECTRIC FIRES, LTD., will show three examples of displacement-type water heaters: one of the orthodox pattern with cold water entry at the bottom, the cold water feed being taken from a ball valve cistern; one for direct supply from the water main, which conforms to Water Boards' regulations as there is a definite break on the cold water feed and a new type of heater with bottom feed, but which embodies



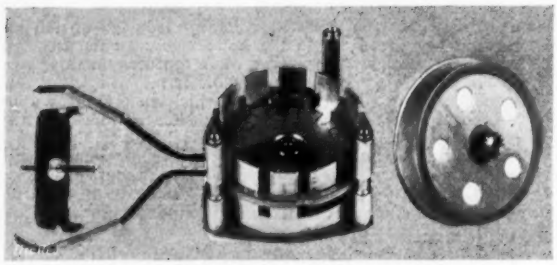
" Xcel " 1-kW Fire



Screened Ferranti Radiator



E.S. Wash Boiler



Venner Synchronous-motor Time Switch

a special arrangement to prevent water running back in the event of the pressure failing and the valve being opened. An example is to be shown of a thermostatically-controlled pressure-type water heater suitable for connecting to ball-valve tanks and for piping up to supply hot water to several taps. Other interesting apparatus to be shown on this stand will include a composite-type heater intended to work in conjunction with a range boiler or a separate coke-fired boiler.

Included in a range of immersion heaters to be displayed by GEORGE GREEN & Co. there will be the "Gee-Gee" automatic heater which embodies a mercury switch which may be set to cut out at a predetermined temperature and will switch on again when it has fallen 10 deg. F. The standard setting is 180 deg. F., but this may be varied to suit specific requirements. The heater offers three outstanding advantages over one controlled by a separate thermostat: lower initial outlay, less trouble and expense to fit, and it protects itself, and the vessel into which it is placed, from damage should the water supply fail.

Two recent products of SANTON, LTD., will be featured at the show, namely, an angle-type circulator designed for fitting into existing tanks where it is more or less impossible to obtain access either to the dome or bottom of the tank, and from which immediate supplies of hot water are available at the top of the cylinder; and a combined circulator and thermostat which the company has recently designed and constructed for the Salford Corporation, being somewhat similar to the makers' standard circulator, but having in the top of the head a thermostat which takes full charge of the circulator. The whole of the operating parts, including the terminals of the circulator, are covered by means of a suitably finished dome.

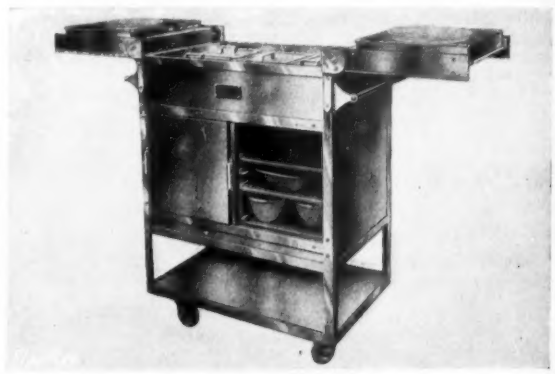
Fires and Room Heaters

CHESTERTON JONES & Co., LTD., will show electric fires in finishes to suit any scheme of decoration and tubular heaters for home and commercial use. Of particular interest will be the patent ceiling heater for use in bathrooms. This consists of a chromium-plated bowlfire arranged for suspension from the ceiling, so as to overcome the danger of having a heater in close proximity to the bath or lavatory basin. There will also be a ceiling heater designed on the above lines, but fitted with a controlling switch. Mottled and plain vitreous-enamelled irons will also be exhibited by this organisation in a large variety, as well as nickel- and chromium-plated irons. One of the special features of "David" irons is the patent either-way connector, which makes it possible for the flexible cord to be brought out either at the top or the side of the connector.

A display of fires by CARRON COMPANY will include the "Blake" and "Collingwood" models, which are particularly good imitations of a live coal fire. Finished in art gold, art silver or art copper, these fires present an imposing appearance. The "Argus" fire which will also be on view is now practically the company's standard for hiring-out. It has been specially designed for hard service, its robust design and construction enabling it to withstand the arduous conditions encountered under service in such schemes. It is available in 1-, 2- or 3-kW sizes.

The exhibits on the official stand of FERRANTI, LTD., will be confined to new developments in connection with the Ferranti fire and electric water-heating equipment. The fire will be shown in a range of new models of simple and attractive design, and a new feature in the form of a screen of polished metal strip on edge will be displayed. This screen, covering the front of the fire reflector, reflects the light of the glowing element and considerably enhances the appearance of the fire. It serves also to render the fire safe for use in nurseries, &c. A new range of attractive settings will illustrate the readiness with which the fire lends itself to the modern trend of interior domestic architecture. The water-heating equipment will include a range of heaters of a new type with self-contained ball-valve cisterns. It will be noticed that the company's heaters of all sizes from 11 gallons upwards now have their elements mounted horizontally. In addition to the stand at the official exhibition, Ferranti, Ltd., have taken temporary premises at 15, St. Nicholas Street.

The exhibit by SIEMENS ELECTRIC LAMPS & SUPPLIES, LTD., will include some attractive models of "Cosyglo" fires, which have a very realistic moving-flame and smoke effect, and also models of the "Homely" series which, particularly in porcelain enamel or the new bronze finish, are very attractive. Two new reflector fires, a new 1-kW imitation-coal fire, and a 3-kW fire of novel design will also be displayed on this stand. Water heating will be represented by samples of "Xcel" hot-water storage tanks which have strong copper water cylinders with well-tinned inside surfaces.

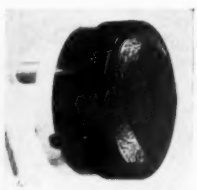


Manor Electrically Heated Hospital Truck

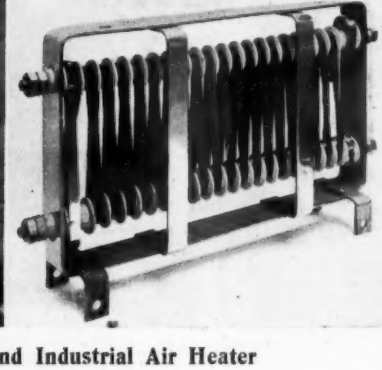
A wide range of "Unity" tubular skirting heaters will be on show on the stand of YOUNG, OSMOND & YOUNG, LTD. The heater consists of an element enclosed in a 2-in. diameter steel tube, and is light in weight, but very strong. The tubes are made in lengths of from 2 ft. to 17 ft., and are loaded at 60 W per ft. standard. The tubes are secured in single or double brackets in oak finish. In addition to a range of water heaters, this concern will also show bus-bar connectors, car-bonnet heaters, 4-bar radiators in oak finish, chromium-plated towel rails, and thermostats, &c.

Wash Boilers

BULPITT & SONS, LTD., will show a comprehensive display of domestic equipment, including a new wash boiler having a loose container, which can be emptied and wiped dry in a few seconds, when it can be used for storing food. It is also a very useful vessel in which to cook foods, but, if



Wylex Fuse-plug



Reyrolle Service Table and Industrial Air Heater **"Magnet" Table Refrigerator**

desired, a separate container can be obtained for this purpose which will occupy no extra space. A safety device is unnecessary, and the heating element consists of spiral resistance coils mounted in refractory formers. Steam cookers, irons, and a new type of circulator are also to be exhibited by this firm.

BURNLEY COMPONENTS, LTD., propose to exhibit a large selection of wash boilers. One boiler in particular will be a new 8-gal. open-top type which was originally built to the specification of a northern city undertaking. Several new fitments will be incorporated in the standard "Burco" boilers, the most important being an improved inner container, a larger-bore free-flowing draw-off tap, and a new type of safety cut-out, with which the consumer can reset the safety switch by raising a small lever mounted on the outside of the wash boiler. The switch is foolproof in every way, and has been subjected to stringent tests.

L. G. HAWKINS & CO., LTD., will have on show a new complete home electric laundry outfit occupying a floor space of only 24 by 39¼ in., with which it is possible to carry out every laundry operation. By the inclusion of a unique self-emptying device the tub is automatically emptied directly into the sink. The "Hera" electric washer will also be shown in various types, in addition to several "Universal" models, including one with a swinging wringer.

The EDISON SWAN ELECTRIC CO., LTD., will exhibit a new wash boiler, the outer casing and lid of which are constructed of blue-enamelled steel, whilst the interior container is built of stout-gauge copper tinned inside. A 3-kW immersion heater is accommodated in the sump at the bottom of the pan, and it is protected from the clothes by a removable perforated cover. A copper spraying device can be supplied if required, which forces a continuous supply of soapy water through the clothes. The boiler is particularly suitable for hiring-out purposes and housing schemes, and has a capacity of 8 gal.

Miscellaneous Appliances

A feature of this year's exhibit by BASTIAN & ALLEN, LTD., will be a small electric steam boiler designed for valet service and small private laundries. When the water supply pressure exceeds the steam pressure required, the boiler can be fed direct from the main and the motor pump dispensed with. A small electrode circulator to be exhibited in this stand is of sufficient size to supply 10 to 12 radiators, which are automatically controlled by thermostats and a contactor.

The DOWSING RADIANT HEAT CO., LTD., will display its cordless electric ironing system, "Solarium" electric sunlight baths, electrically-heated clothing and gloves, and electrically-heated stocking former and glove hand, high-frequency (violet ray) generators, and the "Dexter" washing machine fitted with a heated roller.

The exhibit of the ELECTRICAL ASSOCIATION FOR WOMEN will take the form of a table containing the Association's literature.

The BRITISH ELECTRICAL DEVELOPMENT ASSOCIATION, INC., intends to display a comprehensive display of E.D.A. publicity literature, reports, posters, lantern slides, cinema films, &c., and generally to deal with its various local publicity services. A joint effort will also be made by local members of the Electrical Contractors Association.

The stand of the ELECTRIC LAMP MANUFACTURERS' ASSOCIATION will be designed to deal with two main features of lighting development, namely, electric lamps and lighting service. The special lamp feature will take the form of a 20-ft. tower of striking design studded with Pearl, opal and coloured lamps, and special emphasis will be given to the high quality of lamps made by members of the Association.

The HORSTMANN GEAR CO., LTD., will show a complete range of "Newbridge" time switches from the type "T" 1.5-A, 15-day pattern to the type J/1 50-A electrically wound model. The factor of safety in all parts of the latter is very high, and provision is made for reserve 6 days winding. The size of the movement is small, and it is available either with hand setting or a solar compensating dial.

IONLITE, LTD., will make a special feature of a new system of interchangeable letters which will permit alteration of the letters in signs either weekly or bi-weekly.

Of particular interest on the stand of the MANOR ELECTRIC OVEN & FIRE CO. will be a "Thermotainer" hospital trolley intended for use in a 30-bed ward. The exterior of the trolley is of monel metal with the exception of the angle framing, which is of nickel-plated steel. The bulk of the food is carried in aluminium containers in the upper part of the trolley, the hot cupboards below being used for special dietary foods carried in bowls The average loading of the trolley is only 1 kW, and a temperature of 160 deg. F. is attained in the hot cupboards within an hour of plugging in. The elements used are of the "Manor" standard tubular type, and are arranged in the bottom of the trolley.

A. REYROLLE & CO., LTD., will show, in addition to examples of their heating apparatus, an oil-heater of 9-kW capacity formed of an oil-tight box containing six 1½-kW immersion heaters, each fitted with a 3-pin plug and socket for three-heat control. Air-heating resistances will be another feature of this exhibit. These are designed for use in large industrial drying ovens, and the resistance frames are mounted on a light framework of heat-resisting steel, with two terminals for connecting two or more frames in series or in parallel. A representative selection of Reyrolle's extensive range of plugs and sockets will be shown, as will also a modern electric service outfit comprising a table of oak or other wood mounted on wheels, and with a separate wooden block fitted on one side. To the front of this there are fitted three or more outlet sockets, and one inlet socket is mounted on the back, so that a number of appliances may be connected up by means of only a single flexible lead from the table to the wall-socket.

A new "Wylex" fuse plug to be exhibited by GEORGE H. SCHOLES & CO., LTD., is fused for 5 A, but made the size of a 15-A model, so that it is suitable to be used for the connection of small appliances on to 15-A sockets. The housing of the fuse makes it safe, and the fuse has been tested by the Manchester Corporation on 1,000 A and on a short-circuit of 3,000 A.

An attractive stand will be laid out by the SCARBOROUGH ELECTRICITY UNDERTAKING as an official bureau.

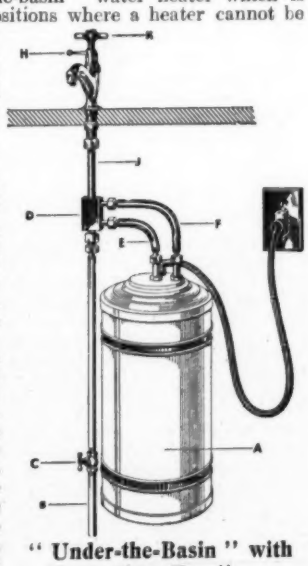
The main exhibit of VENNER TIME SWITCHES, LTD., will take the form of time switches for off-peak water heating. A similar switch to the "ewNZX" will be shown, in which, instead of an electrically wound clock, there is a synchronous motor running at the exceptionally low speed of 200 r.p.m.

New Apparatus and Devices

for Domestic, Cooking and Heating, Lighting, Power and Scientific Purposes

Water Heater with Mixer

The "Inventum Under-the-basin" water heater which is designed for use in those positions where a heater cannot be accommodated conveniently over the basin, and which operates on the push-through principle, is now marketed by ALAN WRIGHT, 117, Victoria Street, S.W.1, complete with the "Mix-a-Tap" which permits hot, cold, or mixed water to be drawn from the same tap on the basin. The additional apparatus consists of a chromium-plated tap of conventional pattern with a small regulating handle, and an extension pipe below the basin to a water-mixing chamber. In the diagram, A is the heater connected to the mixing chamber D by the cold-water inlet pipe E and the hot-water outlet pipe F (these pipes are not supplied); B is the cold-water main controlled by cock C (not supplied); J is the Mix-a-Tap" extension below the basin. The small handle H is turned to the extreme right for cold water and to the left for hot water. With the handle in any position between these two points, mixed water is obtained, the temperature of which can be very closely regulated. With the heater to the left of the mixer the hot- and cold-water positions are reversed. The capacity of the heater is 1½ gallons and the loading (two elements) 500 W.



"Under-the-Basin" with "Mix-a-Tap"

A New Magneto

The BRITISH THOMSON-HOUSTON CO., LTD., Rugby, have recently introduced a new magneto designed specifically to suit four- or six-cylinder commercial-vehicle engines. A 25 per cent. nickel-steel shaft carries a cobalt-steel magnet with laminated-iron poles. The shaft is mounted in two ball bearings and the magnet poles are arranged to rotate between the laminated armature poles. The armature itself is stationary and forms a separate unit mounted above the magnet, on extensions from the armature poles, the latter being cast into the main housing of the magneto. A mica condenser is attached to the armature winding unit. Duralumin is used for the rocker arm to reduce the "fling" at high speeds. Mounted on the main spindle between the make-and-break and the magnet is a steel pinion meshing with the distributor gearwheel, which is made of a special moulded material. The distributor itself is of the jump-spark type, and solid nickel is used for the distributing arm and for the segments.

A Non-reversible Double-pole Connector

SILAS QUAKER, LTD., of 110, Park Street, Camden Town, London, N.W.1, have just produced a new non-reversible double-pole connector admirably suited for use in wireless and electrical circuits carrying up to 5 A. This connector is supplied in a carton complete with screws and a waxed-board distance-piece, and can at present be obtained in black, mahogany, walnut and oak "Bakelite" finishes. In a few weeks' time a number of other colours will be also available.

Clerk Maxwell

The centenary of the birth of the master mathematician occurs to-morrow, June 13th

FOR more than half his brief life of forty-eight years James Clerk Maxwell, whose birthday centenary occurs to-morrow, held an unchallenged position in the foremost rank of physicists. He was the first to make colour sensation the subject of actual measurement, carried off the Adams prize for his brilliant discussion of the dynamical conditions of stability of the ring system of Saturn, provided a classic in science in his "Discourse on Molecules," and his investigation of the kinetic theory of gases was by general consent rated as of first-class importance. But it was in the domain of electricity that he won his greatest laurels, and by virtue of the fact that he laid the basis of a physical theory of electric and magnetic phenomena quite as securely founded as is the undulatory theory of light, electricians all over the world will welcome the opportunity of joining in a tribute to his memory.

Scholastic Career

James, the son of John Clerk Maxwell, of Middlebie, Dumfrieshire, was born at Edinburgh on June 13th, 1831. Entering Edinburgh Academy at eight, he early made manifest his predisposition towards scientific study and before he was fifteen wrote a paper "On the Description of Oval Curves," which was read for him by Prof. Forbes to the Royal Society of Edinburgh.

Passing to the University of Edinburgh where he specialised in mathematics, natural philosophy, chemistry, and mental philosophy, he attracted attention by two valuable papers "On the Theory of Rolling Curves" and "On the Equilibrium of Elastic Solids." At Cambridge he became a pupil of the famous coach, Hopkins, and carried off many honours. He was first elected a scholar of his college, then graduated as second wrangler, the premier position being taken by Dr. Routh, of Peter House, with whom he was bracketed in the more exacting ordeal for the Smith's Prize.

In 1856 he was appointed professor in Marischal College, Aberdeen, and four years later joined King's College, London, in the same capacity. He had been successively Scholar and Fellow of Trinity and in 1871, when he secured the honour of election to the new chair of experimental physics at the University of Cambridge, he was made an honorary Fellow of Trinity. His first work was to arrange the details of a physical laboratory, the gift of the Duke of Devonshire, then Chancellor of the University, and the next five years were rich with the fruits of labours which were of material benefit in clearing away the obscurities from various problems of importance. The extraordinary thing is how, with so many other absorptions, he found time to devote so much consideration to electrical subjects. His *magnum opus*, the treatise on "Electricity and Magnetism," was a remarkable and outstanding work.

Theory of Electricity

Following in direct line of succession to Faraday, he applied what has been aptly described as "the steady light of patient thought" to the construction of a theory of electricity in which action at a distance should have no place. The trend of his thought was primarily indicated by a paper on "Faraday's Lines of Force," which was read before the Cambridge Philosophical Society in 1855, and he set out, as he himself explicitly stated, not to attempt to establish any physical theory of a science in which he had hardly made a single experiment, but to show how by strict application of the ideas and methods of Faraday the connection of the very different order of phenomena which he had discovered might be placed before the mathematical mind. He was in close touch with Sir William Thomson, afterwards Lord Kelvin, and on the advice of that great scientist worked his theories out with the aid of analogies with corresponding phenomena in hydro-dynamics and heat.

The view held by Maxwell showed the originality of his method of approach to the problem. In his judgment, "electrical and magnetic effects do not arise from the attraction of electric, or magnetic matter distributed over the surfaces of conductors, or magnetic bodies, but are the means by which changes of some unknown description in the ether which fills space, or in some of its properties, become known to us." He argued that "in consequence of these changes energy is stored up in the ether, and electrical, or magnetic, forces are one form of the manifestation of changes in the distribution of energy."

Novel Departure

Step by step he proceeded in the elaboration of his theme, and emphasis is laid by one of his biographers on the important departure he made in his paper "On a Dynamical Theory of the Electro-magnetic Field" by "applying dynamical equations in the generalised form given to them by Lagrange to the problems of electro-magnetism, in dealing with which we are led to the conception of a complicated mechanism capable of a vast variety of motions, but at the same time so connected that the motion of one part depends, according to definite relations, on the motion of other parts."

It may be true that his electro-magnetic theory of light cannot be accepted in every detail; Helmholtz held different views, but Maxwell was perfectly sound in his conclusion that electro-magnetic action resembled light in the fact of travelling through space in waves. It was left to Hertz to apply actual measurement to the velocity of electro-magnetic waves, and to show that they are propagated and can undergo reflection, refraction, and polarisation in the same way as waves of light. Nevertheless, Maxwell accomplished something which Faraday himself was never able to do in explaining the mechanism at one time of light, electricity, and magnetism. Moreover, his contributions to electrical science were not restricted to theories alone.

On the practical side, as a member of the sub-committee of the Electrical Standards Committee of the British Association, appointed to construct the standard of resistance, he was responsible for the necessary experiments in his own laboratory at King's College. Amongst other things, he discovered that viscous fluids, while yielding to stress, possess double refraction. Ten years before his death he undertook the task of editing "The Electrical Researches" of the Hon. Henry Cavendish and enriched the work by copious and valuable original notes.

James Clerk Maxwell

Reproduced from a photograph presented with the "Telegraph Journal and Electrical Review" of January 15th, 1880.

He was a ready and voluminous writer, and in addition to a large number of papers on various subjects he was responsible for a notable text book on the "Theory of Heat," and an illuminating treatise on "Matter and Motion." To other accomplishments he added a quite unusual power of epigrammatic versification, and considerable skill in illustration, especially by means of diagrams.

Personal Appearance

He was of middle height, with a strongly knit frame, and there was in his gait a strong suggestion of elasticity. He always dressed with a view to comfort rather than elegance. His face expressed sagacity combined with good humour, but it was invariably set in lines of deep thoughtfulness. His features were bold, but pleasing; his eyes were dark and glowing, and the blackness of his beard and hair threw into striking relief the pallor of his complexion. "He might," says a writer who knew him well, "have been taken by the careless observer for a country gentleman, or rather, to be more accurate, for a north-country laird. A keener eye would have seen, however, that the man must be a student of some sort and one of more than ordinary intelligence."

He was indeed the master mathematician and electrician, holding his own in company even with such a giant as Lord Kelvin. Maxwell generally spent his vacations at the country house at Glenlair, which he inherited from his father. He was taken seriously ill while staying there during the summer of 1879. He returned to Cambridge in the October, but a painful malady had got too strong a hold upon him and he died on November 5th, 1879.

A Faraday Tribute

This "Beama" appreciation† has been well written by Mr. E. W. Ashcroft. Not without reason was the early life of Faraday held up as a moral object lesson for children! Born in poverty, his family obtained public relief in 1801, Michael (the third of four children) had no education, which was of little importance to an intellect so independent and isolated as his . . . . . "I could trust a fact and always cross-examined an assertion." Of material influence on the whole family was its religion, which protected and strengthened the boy, and on June, 1821, at the age of 28, he married Sarah Barnard (the daughter of a silversmith, who was also a Sandemanian) an event which "more than any other contributed to his earthly happiness and healthful state of mind." There was something inevitable behind the progress of Davy's assistant, who was to carry the Royal Institution through its second crisis and give it an even more brilliant reputation than it had established for itself before. The book is cleanly printed and has a frontispiece after the picture in the National Portrait Gallery.

† *Faraday*; 8 vo., pp. 134. London: British Electrical and Allied Manufacturers' Association, Inc. Price 7s. 6d. net.

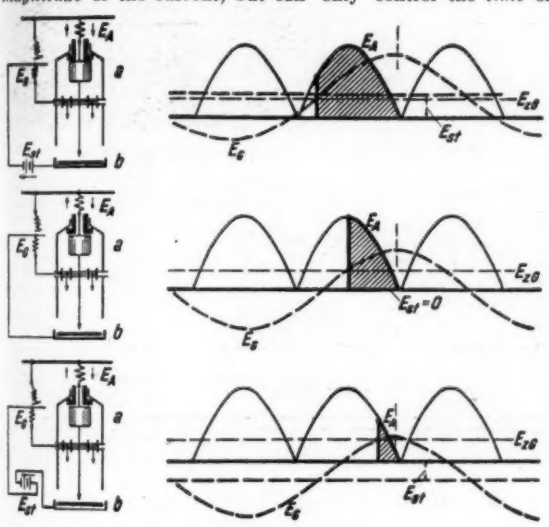
Mercury-arc Rectifiers

Recent Developments in their Application to Heavy-duty Work

By H. RISSIK, B.Sc. (Eng).

THE development of the mercury-arc rectifier has taken place concurrently with that of the thermionic valve. It is therefore natural that efforts should have been made to translate to the heavy-duty rectifier, on a larger scale, principles and methods whose application has made wireless telephony and broadcasting possible. The success with which such efforts have at last been crowned must be attributed to the perfecting of the heavy-duty rectifier during the last few years. New fields of application have been opened up. On the one hand, solutions have been found to problems already recognised in patent literature as partially soluble, *e.g.*, voltage regulation and power regeneration. On the other hand, entirely new problems have been solved also, such as the generation and utilisation of high-voltage direct current and the change of frequency without the aid of direct current as an intermediate link.

Like the thermionic valve, the mercury-arc rectifier is a vacuum tube subject to the influence of electrostatic fields which can be controlled by means of suitable grids. The grid of a controlled mercury-arc rectifier, however, functions differently from that of a thermionic valve. The latter normally permits of a control of the amount of current flowing through the valve. As soon as it is surrounded by ionised mercury vapour, however, it ceases to have any influence on the *magnitude* of the current, but can only control the *time* of



a = Anode, *b* = Cathode.

Fig. 1.—Controlled Rectifier

current flow. Thus, in the thermionic valve the amount of current flowing from anode to cathode is determined by the potential and polarity of the grid. In the case of the controlled rectifier on the other hand, current cannot flow at all unless the potential applied to the grid exceeds a certain critical value. By adjusting the mean potential of the grid, it is then possible to control the instant at which current begins to flow. The current, once having started, continues to flow until the alternating anode voltage falls to zero.

Regulation of Voltage and Power Output

Like the ordinary rectifier, therefore, the controlled rectifier is a unidirectional valve, but with this important difference—it can determine the initiating of the current arc; so that the output may be controlled by varying the period during which current can flow (that is, the active part of the anode voltage wave).

This phenomenon is illustrated in fig. 1 which refers to one anode of a single-phase rectifier. The anode sheath contains a grid, situated immediately below the anode head, to which is applied a steady control voltage E_{st} and a sinusoidal voltage E_g. The critical grid voltage, that is, the voltage which the grid must attain before the current arc can establish itself, is represented by E_{zo}. The positive half wave of the alternating anode voltage is indicated by E_A. As may be seen from fig. 1 the voltage resulting from the combination of E_g and E_{st} reaches the critical value at different instants according to the value of the mean grid potential E_{st}. The rectified current—represented by the shaded area—continues until such time as the anode voltage E_A falls to zero. Should the rectifier be operating against a counter e.m.f., the current will continue to flow until the anode voltage falls to a value

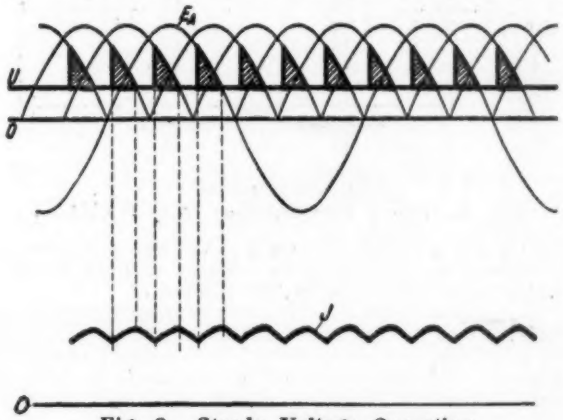


Fig. 2.—Steady Voltage Operation

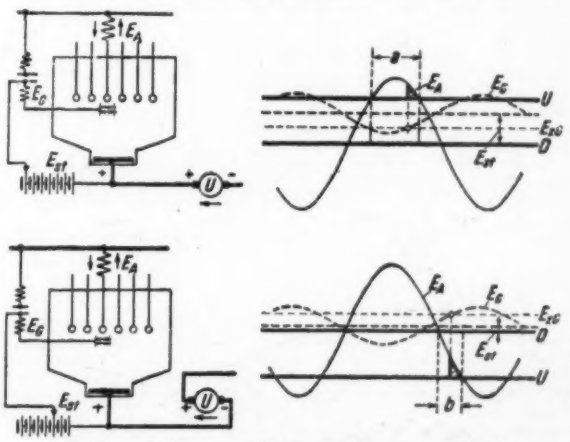
equal to this back e.m.f. The extension of this principle to a six-phase rectifier operating against a steady voltage U is shown in fig. 2. In spite of the "jaggedness" of the individual anode currents (represented by the shaded areas) the resulting rectified current J is scarcely less smooth than that delivered by a normal rectifier on account of the influence of the inductances in circuit.

Any application of the above principles has been limited until quite recently to the control of comparatively small outputs. In a recent paper on the "Distribution of Electric Power with High-Voltage Current" before the Midwest Power Engineering Conference at Chicago, C. W. Stone has indicated the possibilities of the "Thyratron" (glass-bulb mercury-arc rectifier with grid control), referring to units having an output of 150 kW at 250 volts. This compares favourably with the ordinary type of glass-bulb mercury-arc rectifier which has a maximum capacity of some 200 kW at 600 volts.

Parallel to this American development, research has been carried out on the Continent which has culminated in the successful application of grid control to heavy-duty rectifiers, and one well-known manufacturing firm is now in a position to equip its entire heavy-duty rectifier range with grid control in order to obtain continuous regulation of voltage and output. Tests on a 1,000-kW unit show that the voltage, and therewith the power output of the rectifier, can be smoothly varied from zero to the maximum with a grid consumption of only 20 kW.[1]

Inversion of Direct to Alternating Current

Grid control of heavy-duty rectifiers has also paved the way

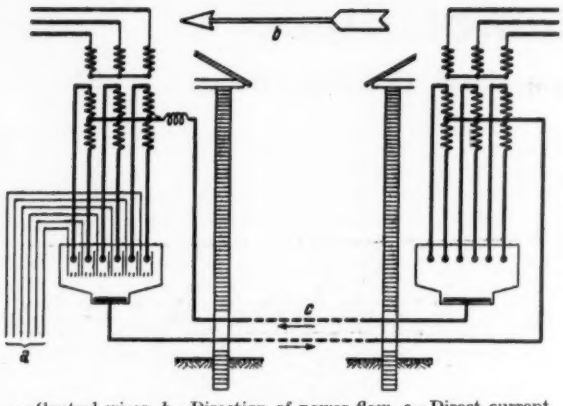


a = Region of energy supply, *b* = Region of energy return.

Fig. 3.—Control by Adjustable Grid Potential

to energy regeneration, the inversion of continuous to alternating current energy being accomplished by reversal of the

[1] "Siemens-Zeitschrift," Vol. XI, 1931, p. 143.



a = Control wires, *b* = Direction of power flow, *c* = Direct current transmission at 100/200 kV.

Fig. 4.—Power Transmission; A.C.-D.C.-A.C.

voltage and not of the current as is the case with rotating machines. The rectifier is by its nature an apparatus through which current can flow in one direction only.

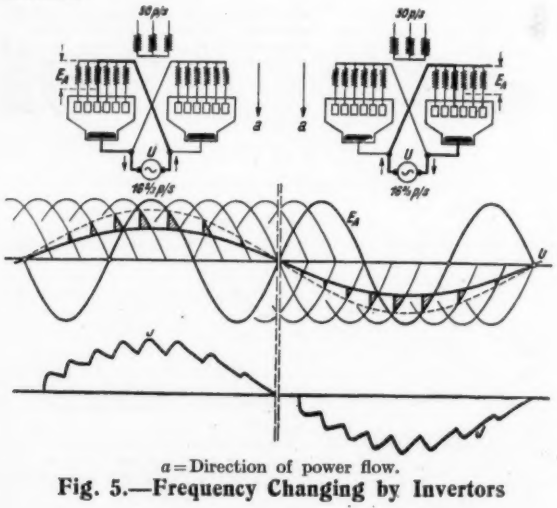
The mode of operation of the invertor may be seen from fig. 3. The upper illustration shows the conditions (normal) for a controlled rectifier operating against a steady voltage U. The lower illustration shows how the rectifier can be made to feed back energy to the a.c. supply when this voltage is reversed. In the former case the rectifier operates as a *convertor*, in the latter case as an *invertor* of electrical energy. It is apparent that the grid control must function in such a manner that the "valve action" of the rectifier only takes place for a very short time just before the anode voltage E_A reaches the same value as the d.c. voltage U.

Investigations have proved that energy inversion in the manner above described can also be obtained over the entire load range of the rectifier. Such a controlled rectifier affords a simple and efficient means of starting up a heavy reversing mill motor, stopping it by regenerative braking and then immediately reversing it.

Direct Current Transmission at High Voltage

Perhaps the most interesting avenue opened up by the application of grid control to the heavy-duty rectifier is the transmission of direct current at high voltage. This idea is not new. On the contrary it is one with which the electrical engineering world has toyed for close on half a century. Thury built the first high-voltage d.c. power transmission line in 1887. The experience gained in this field since that time together with Thury's own views on the future prospects of d.c. transmission are admirably summarised by him recently.[2]

As is well known, load division between stations in an interconnected d.c. system can be entirely controlled by adjustment of the individual station voltages. In the case of a.c. networks, on the other hand, the flow of power can only be controlled by frequency adjustment. Alteration in voltage only modifies the distribution of the current circulating in the system. Apart from the advantage arising from this fundamental difference between the two methods of power transmission, a d.c. link between two a.c. power systems has the great advantage that parallel operation is simplified. Synchronising is done away with, whilst circuit-breakers of large rupturing capacity on the high-voltage side are no longer necessary.



a = Direction of power flow.

Fig. 5.—Frequency Changing by Invertors

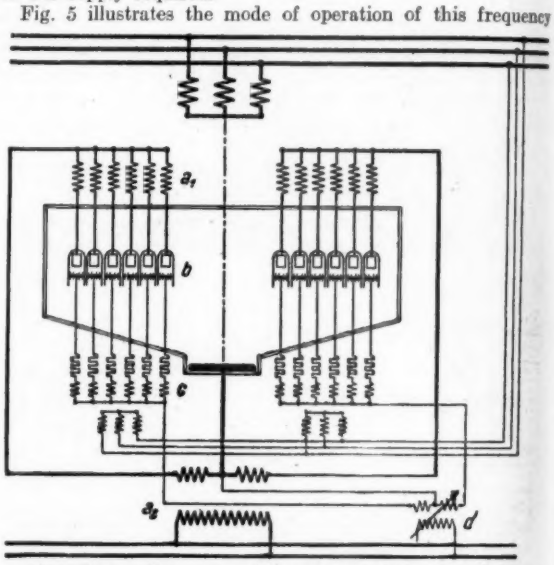
Fig. 4 illustrates diagrammatically the interconnection of two a.c. networks (which may either be of the same or of different frequency) through a d.c. link. It is obvious that such an arrangement is only economical when the voltage at which power is transmitted through the link is high. For this reason Continental rectifier manufacturers have lately been devoting their attention to the development of high-voltage heavy-duty rectifiers. Here again, an influencing of the arc discharge by means of grids has been instrumental in attaining high operating voltages. Investigations recently made have proved so successful that not only has a 30,000 volt rectifier unit been constructed, but it seems likely that much higher voltages are in sight[2]; tests show that the limiting voltage for a single rectifier has by no means been reached.

Frequency Changing

The method of power transmission depicted in fig. 4 will be of value in the future in those cases where both a.c. systems have nearly the same frequency and where the distance between them is great. In those cases, however, where the difference in frequency is large and the distance small it is possible to adapt the controlled rectifier to a method of frequency changing which does away with the direct-current link.

A frequency-changer has been patented which makes use of an invertor in which the d.c. control voltage (F_{ST} in fig. 1) is replaced by an a.c. control voltage of the same periodicity as the supply required.

Fig. 5 illustrates the mode of operation of this frequency



a_1 = 50-cycle transformer, a_2 = 16⅔-cycle transformer, *b* = Grid control equipment, *c* = Sinusoidal grid voltage, 50 cycles, *d* = Control voltage, 16⅔ cycles (adjustable).

Fig. 6.—Invertor Frequency Changer

changer. A reference to Fig. 2 makes it clear that the continuous operating voltage U, *i.e.*, the counter e.m.f. of zero frequency, is now replaced by an alternating operating voltage U, of the same frequency as the grid control voltage. Similarly, the output current J, formerly continous (fig. 2), is now also sinusoidal (fig. 5). As it is not possible to reverse the direction of current flow in a rectifier it is necessary to employ two invertors, one for each half-wave of the outgoing supply voltage. The connections of such an invertor set for obtaining a traction supply of 16⅔ cycles from an industrial 50-cycle network are shown in fig. 6. A 2,500-kVA frequency-changer of this type is being supplied to the German Federal Railways for single-phase supply at 15,000 volts, 16⅔ cycles.

This method may be used for the speed regulation of large induction motors, as the slip energy of the rotor circuit can be directly transferred back to the stator circuit without giving rise to the losses and additional complication associated with Krämer or Scherbius control.

In the future electricity may possibly be generated at a frequency corresponding to minimum generating cost, while the conversion to other required frequencies including zero frequency, *i.e.*, continuous current, will be accomplished by the heavy-duty rectifier. Transmission over the shorter distances will be by high-tension alternating current as is at present the case. Where long-distance transmission is contemplated, *e.g.*, in the linking-up of the power sources of Europe and Asia, high-voltage direct current will be employed. Only in the final conversion of electrical to mechanical power will the rotating machine maintain its position.

[2] René Thury: "Long Distance Power Transmission by means of High-Tension Direct Current," E.T.Z., Vol. 51, 1931.

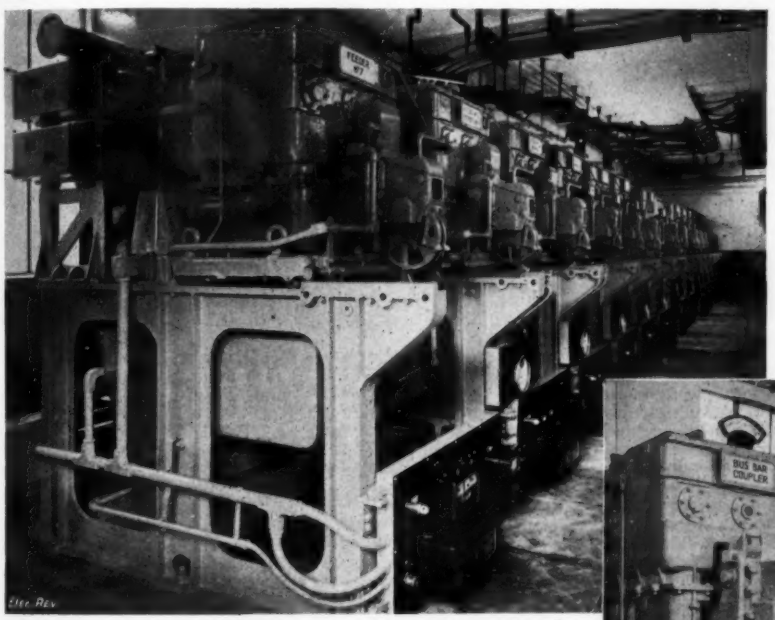
Hastings Switchgear

Inauguration of a new installation at the municipal generating station

THE popular seaside resort of Hastings was one of the first towns to enjoy a public supply of electricity, an electric lighting company having commenced operations in 1882. The undertaking was purchased by the municipal corporation in 1898 and, following progressive extensions, a new generating station was built in 1925 at Broomgrove, at which time the original 100-cycle a.c. system was also changed over to the national 50-cycle 3-phase standard.

Whereas the borough itself is of an area of some eight square miles, the extended area now served is of 152 square miles, whilst the Corporation supplies in bulk the neighbouring town of Bexhill and also supplies and distributes electricity in Rye, Winchelsea, Battle, and numerous villages by 20 miles of underground and 73 miles of overhead cable.

The growth of the demand during the last six years has been remarkable, as the following figures will indicate: the energy generated increased by 21,278,184 to 25 million kWh; the maximum demand by 9,505 to 11,400 kW; the total connections by 19,835 to 26,984 kW; and the number of consumers by 9,191 to 15,351. The Corporation Electricity Department has its own extensive showrooms and sells direct to consumers; it also carries out wiring installations on the cash, hire-purchase, and rental systems. Cookers and other domestic appliances can be hired and a Service Department looks after customers' requirements, while the tariffs are still attracting consumers of all classes at a rapid rate.



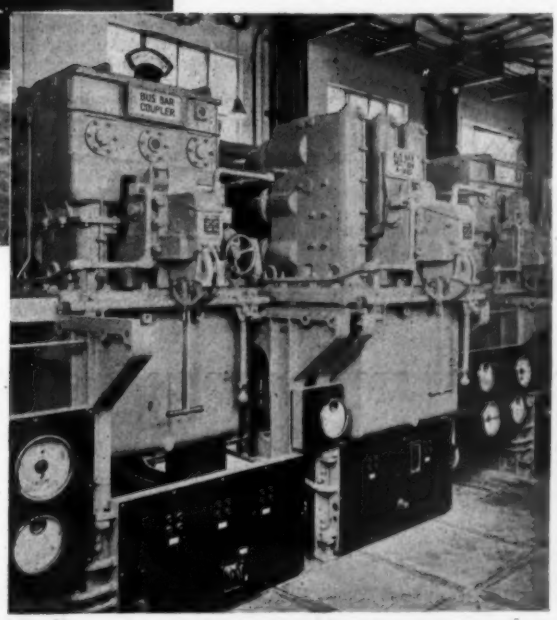
New 11,000-volt Grid Switchgear at Hastings

The connection of the Broomgrove power station to the national interlinking grid transmission network of the Central Electricity Board has necessitated the installation of new switching equipment, which is illustrated herewith. Three-phase power is generated at Broomgrove at 6,600 volts, but in order to transmit it economically to the outlying districts it is transformed up to 11,000 volts. The new switchboard will deal solely with power at this pressure. The 132,000-volt lines of the Central Electricity Board will be linked to the new switchboard by transformers situated in the Board's sub-station, and the supply thus made available from the grid can be used either for 11,000-volt transmission to the extended area, or at 6,600 volts for local supplies; alternatively, the generating plant at Hastings can, if required, feed its surplus output into the grid system for assisting other stations connected to it.

The fourteen-unit switchboard has been constructed to the specification of Mr. A. J. Ryan, M.I.E.E., A.M.I.Mech.E., borough electrical engineer, in conjunction with the engineers of the Central Electricity Board, and is of the modern armour-clad, compound-filled type, as manufactured by the English Electric Company at its Stafford works. Each unit has a rupturing capacity of 500,000 kVA at 11,000 volts, and weighs about five tons. The board is provided with duplicate bus-bars and hand-operated selector switches, in order to give a high degree of flexibility for grouping the various circuits and for isolating sections of the board for examination and other purposes. The oil-immersed circuit breakers are hand-operated switches designed to open automatically in the event of serious overloads or other disturbances on the system. Such occurrences may give rise to considerable stresses in the switches which come into action, and therefore their oil tanks were constructed of heavy boiler plate and tested to a pressure of 250 pounds per square inch before they left the factory; each circuit-breaker tank contains about 80 gallons of oil.

The 132,000-volt switching station of the Central Electricity Board is adjacent to the Broomgrove power station, and by arrangement with the Hastings Electricity Department the control board for it is situated in the power station. The whole of this switching equipment was also constructed by the English Electric Company.

The official inaugural ceremony of the new installation was performed last week by the Mayor of Hastings, Councillor G. H. Ormerod, whose speech was replied to by the chairman of the Corporation Electricity Committee, Councillor E. M. Ford, and by Mr. V. Watlington, on behalf of the contractors. At tea there was a gathering of 120 and in the evening visiting station engineers met the contractors on the Golf Club course.



Canal Electrification in France

In a recent issue of *Science et Industrie*, Mr. G. Soleil describes the work of electrification of the St. Quentin Canal, which comprises a 7¼-mile section between Elrun and Cambrai, one of 58 miles between Cambrai and Chauny, and one of 21¼ miles between Chauny and Janville. The object of electrification is to increase the traffic capacity of this important navigable route, which connects the industrial region of the north of France with the eastern districts and the Paris area. The work comprises: (i) the substitution of haulage by electric tractors along the banks for horse or manual haulage; (ii) the electrification of tow-boats, which haul the chains of barges in the sorting reaches where the circulation in unidirectional; (iii) the installation of electric and automatic drives for opening and closing the lock-gates and their sluice valves; (iv) the installation of remote control for the lock tractors for increasing the rapidity of entrance and exit of barges in the lock chambers. The first two sections of the work have already been completed. The electrification of the whole of the controls of the gates and sluice valves and the remote control of the lock tractors in the southern section of the canal between Janville and Chauny is expected to be completed before the end of the present year. The tractors are fed from overhead conductors with d.c. at 600 V, converted from 15,000-V 50-cycle three-phase a.c. at sub-stations along the canal. Altogether 360 tractors are now in use, they being each fitted with a 16-h.p. series motor.

Non-ferrous Metals Research

New administrative premises and central research and development laboratories have been established in London

SINCE its foundation just over ten years ago the valuable work of the British Non-ferrous Metal Research Association has grown to dimensions which demand concentration and centralisation. The new London premises, which were officially inaugurated on June 8th by Lord Rutherford, O.M., F.R.S., house the general and administrative staff, a library and efficient information bureau, development section, and central laboratories wherein a limited amount of research will be conducted under the direct supervision of headquarters, whilst continuing the policy of utilising national and university laboratories for extramural work.

All-British Photo-microscope

Electricity is purchased from the St. Pancras municipal undertaking on very favourable terms for all purposes at 440 volts for power and 220 volts for lighting and heating on the 3-wire d.c. system. As power is available at the low cost of 0.5d. per kWh, provision has been made for the use of up to 140 kW for furnace work, and, in addition, a motor alternator set has been provided, specially designed to supply alternating current over a wide range of single or three-phase frequencies and voltage, by Crompton Parkinson, Ltd., to the specification of Mr. Julius Frith, M.Sc., and has been designed for taking an extension to the bedplate for a high-frequency alternator or other machine of a capacity up to 100 kW.

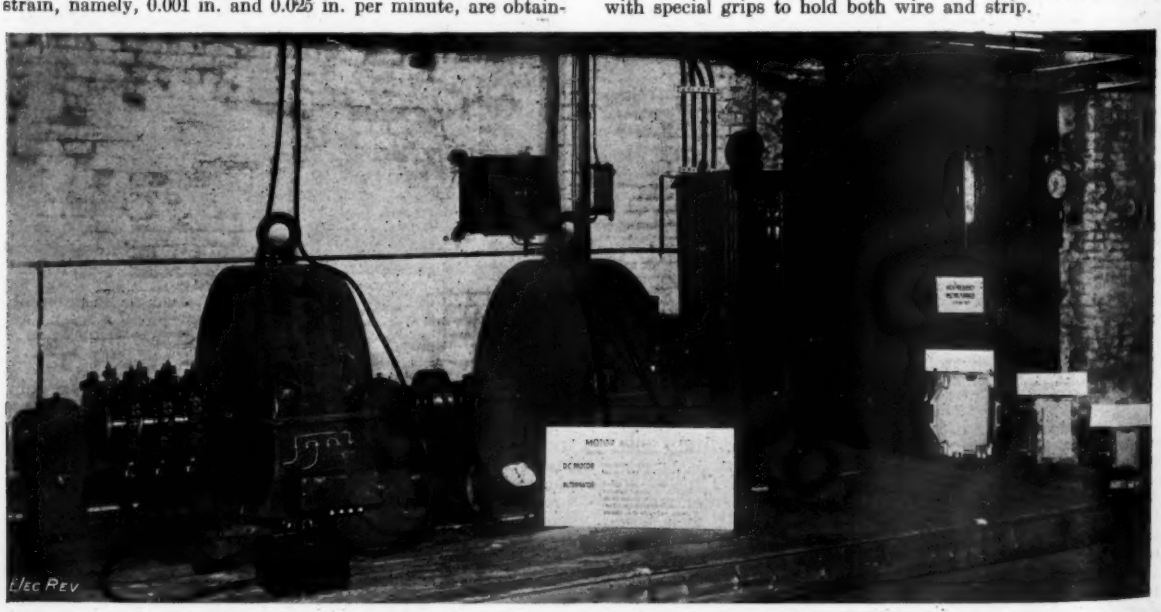
In the mechanical testing section the present equipment is suitable for the application of tensile, hardness, impact, cupping, bending and other tests, and includes a machine specially designed for the Association by Mr. R. W. Bailey, of the Metropolitan-Vickers Electrical Co., Ltd., and intended for slow tensile tests at elevated temperatures. Two rates of strain, namely, 0.001 in. and 0.025 in. per minute, are obtainable and it is also possible to provide for creep tests at a rate of strain of 10^{-3} in. per hour or more. The machine is provided with suitable apparatus for automatically recording the load extension diagram, so that tests may be made continuously through the night as well as during the day; the equipment also includes a thermostat to give constant temperature control to within two degrees Centrigrade.

The annealing section is equipped with an electric "Birlec" furnace made by the Birmingham Electric Furnace Co., Ltd., having a hearth capacity of 32 in. by 20 in. and capable of maintaining a constant temperature up to 1,000 deg. C. The furnace is fitted with automatic thermostat control and a pyrometrical outfit. A furnace of 25 kW made by the Electric Resistance Furnace Co., Ltd., is of a novel type, using non-metallic resistor rods with direct current which are thus raised to a high temperature and radiate their heat on to the crucible, which can have a maximum capacity of 120 lb. of copper. The rods are arranged in two separate 220 volt d.c. circuits, each of which is provided with a regulating resistance to control the temperature and thus the speed of melting, and to make suitable adjustments for any variation in the resistance of the heating rods with age.

A small high-frequency furnace equipment has also been provided in the basement in direct proximity to the motor-alternator, from which it takes its current at 50 cycles. Three separate furnaces are provided of maximum capacity 22 lb., 11 lb., and ½ lb. copper, respectively. This equipment has been supplied by the Electric Furnace Co., Ltd., on most generous terms.

In the general research laboratory there are an electric furnace for annealing small samples, a small melting furnace, potentiometer for temperature measurement and control, and a thermo-couple potentiometer for accurate measurements by Messrs. H. Tinsley, reading to 1 microvolt over three ranges of one to 0.001 volt, 0.1 to 0.00001 volt and 0.01 to 0.000001 volt. For atmospheric corrosion tests special apparatus is installed for the accurate measurement of electrical resistance of wire coils. The analytical laboratory, in addition to the usual equipment, is provided with an electric muffle and an electric hot plate.

In the microscope room, which has also been arranged for resistivity and other electrical measurements, are two motor-driven polishing machines and a projection microscope designed by Mr. R. L. Smith, of Vickers, Ltd., and made at Erith, which has novel features. Two lamps, a clockwork arc lamp and a pointolite lamp are carried on a swivel support at the end of the optical bench, so that the change from one type of illumination to the other can be made instantaneously. The objectives are mounted in special centring and magnetic mounts, enabling them to be changed without unscrewing and secured very readily in a magnet holder fitted to the upper end of the microscope tube. The objectives and eye-pieces for this equipment are also of British manufacture, and were specially selected for the Association by Sir Herbert Jackson and the British Scientific Instrument Research Association for use at magnifications ranging from 3 to 2,500 diameters. In this room is also installed a Kelvin double bridge for the measurement of electrical resistivity with an accuracy of the order of 0.1 microhm; it is provided with special grips to hold both wire and strip.



Special d.c.-a.c. Motor-generator and High-frequency Melting Furnace

Electricity in the Home

Women Delegates at Glasgow emphasise the importance of early education in the use of electrical appliances

THE Second International Conference of the Electrical Association for Women opened at the Central Hotel, Glasgow, on Wednesday, June 3rd, with an informal reception by the Lady Belhaven and Stenton, president of the Glasgow and District Branch. During the evening a mock trial was presented by members of the Manchester and Salford Branch in which John Nodole brought an action for damages against Gloom & Glare Unlimited, on account of personal injuries caused by the alleged negligence of the defendants in the provision of adequate illumination.

Opening Ceremony and Papers

On Thursday morning the formal opening ceremony of the Conference took place at the Royal Technical College, when the Rt. Hon. the Lord Provost (Sir Thos. Kelly, D.L., J.P.) welcomed the delegates on behalf of the Corporation of the City of Glasgow.

Mr. Robert Robertson, M.Inst.C.E. (chairman of the Glasgow Technical College) referred to the valuable research work carried on by Prof. S. Parker Smith in the most important domestic application, *viz.*, hot water, with especial reference to the design of tanks and their insulation, and also in cooking and heating. Prof. Parker Smith's experience in the design and operation of an all-electric house had proved the latter to be an economic proposition.

Professor G. W. O. Howe, D.Sc., M.I.E.E. (Glasgow University) spoke of the work of Faraday and Kelvin, and hoped for a speedy settlement of the local frequency standard.

Lady Moir, O.B.E. (president, E.A.W.) delivered an address, and Mdme. Silfverhielm, Mdlle. Bernège, and Mdme. Karen Braae then read papers on electrical education and domestic developments in Sweden, France and Denmark in an abbreviated form. The presidential address and the papers were dealt with in our last week's issue.

An unannounced item in the programme was an address—witty but serious—by Dr. Elizabeth Sloan Chesser, M.D., who is deeply interested in the application of electricity to medicine which she believed would save countless operations and would, within the next 25 years, supersede surgery.

Speeches at the Luncheon

The session was followed by a luncheon at the Central Hotel at which Catherine, Countess of Westmorland, proposed the toast of "the City of Glasgow" and referred to the connection of the city with engineering and shipping. The *Viceroy of India*, on which cooking and other services were done electrically, was a typical product.

Bailie T. S. Park (sub-convener Electricity Committee) welcomed the visit of the E.A.W. especially in view of Glasgow's Empire and Civic Week, which he hoped would have an effect in stemming the tide of business stagnation and unemployment there. He expressed his faith in low charges for electricity and said that when industry got going again this would have a beneficial reaction on domestic rates.

Mr. A. C. Cramb (director, E.D.A.), proposing "the Electrical Association for Women," said that its success had been due to two causes, *viz.*, the recognition that electricity would give to women the means of a fuller life, and the energy, courage, and foresight of its founders, and particularly to its director, Miss C. Haslett. Women should use their influence to secure simple tariffs. Electricity had hitherto been generated, distributed, and bought—not sold; very few attempts had been made to train salesmen and saleswomen.

Response was made by Miss Mary MacKirdy (chairman, Glasgow and District Branch, E.A.W.), who mentioned the lectures for teachers and discussions with the educational authority in Glasgow last winter. It was hoped that certificates for proficiency would be issued in the near future.

Lady Moir, O.B.E., proposed the health of "Our Guests," which included magistrates and leading men and women in the educational and medical worlds, as well as delegates from other countries.

Dr. Sloan Chesser, responding, said that decent housing was behind all moral and social reform, and in the promotion of this electricity was a great factor, not only in improving comfort and hygiene but in its promise in the medical field.

Visit to a Hydro-electric Station

The afternoon was occupied by a visit to the Stonebyres power station where tea was taken at the invitation of the Clyde Valley Power Co., for which Messrs. Robt. Robertson, E. T. Gosling, and W. T. Williamson acted as hosts. Mr. Robertson (speaking this time as a director of the power company) made a brief speech, to which Mrs. Seward replied on behalf of the E.A.W. This station is one of two (the other being Bonnington) owned by the Lanarkshire Hydro-Electric Co.—a subsidiary undertaking. Two 2,840-kW vertical English Electric Co.'s alternators are driven by water turbines, which have a working head of 97½ ft. The scheme is remarkable in that it makes use of the waters of the Clyde without storage against drought, as the load can be taken up by the interconnected steam plant. This omission of storage has enabled the scheme to be constructed at a cost of £27 per kW.

Thursday Evening Function

In the evening a full civic reception was accorded in the sumptuous City Chamber to the delegates by the Rt. Hon. the Lord Provost, supported by Glasgow magistrates, whose ermine robes and regalia contributed effectively to an impressive scene. A few brief speeches appropriate to the occasion were made by the Lord Provost, Lady Moir, O.B.E., the Lady Belhaven and Stenton, and the Lord Mayor of Manchester. The delegates then had the option of listening to an excellent programme of vocal music or of dancing in the Banqueting Hall, according to their tastes and physical abilities.

Discussions on the Papers

On Friday morning a film brought over by Mdme. Silfverhielm from Sweden was shown at the Royal Technical College. This was the type of propaganda film used a good deal and was popular among women's organisations. The film, entitled "How an Electric Kitchen Grows in Sweden," showed the difficulties of starting the wood fire, and was followed by pictures of different types of electrical kitchen equipment in use in that country.

The heat-storage cooker was described by Mrs. Dover, who had carried out some experiments on one sent over, on behalf of the E.A.W. some time ago, and Mrs. de Ferranti stated that her son had been using a cooker of this type for over a year and found it very satisfactory and economical.

The discussion on the previous morning's papers was opened by Councillor Mrs. Gregory, of West Ham, vice-chairman of the E.A.W., who said that education should be given to the children in the schools as well as to women in their own homes.

In West Ham, lectures had been given on Saturday mornings to domestic science teachers who had asked for a further series, and it had already been arranged that a course should start in the autumn.

The Importance of Education

Mrs. Gregory thought the time had come for electrical teaching to be given in all schools. All-electrical equipment should be put in all new and reorganised schools.

She was specially interested in the question of prizes, brought up in the French delegate's paper, and she thought it would be excellent if, instead of awarding many individual prizes of books, the school would award to the whole class small electrical working toys similar to the cooker presented to the E.A.W. by the late Dr. S. Z. de Ferranti, and electrical games for classes in the primary schools.

The cinema was a field which offered much scope for development and so far she had not seen an electrical film shown in any public cinema, even among the educational films which were shown from time to time.

Miss Cowan, O.B.E., M.A., suggested that there were two big controls in electrical development and education—the training colleges and women with the vote. The former should be well equipped with electrical appliances which must be used and tested, and the latter should ask their candidates at municipal elections what were their views with regard to electrical development in the schools and for the homes.

Replies to a questionnaire sent out by Miss Cowan showed that all new schools being erected in Scotland were being wired for electric cookers. Miss Cowan was of the opinion that all three methods of cooking should be taught in the schools—the coal range, the gas oven, and the electric cooker. She thought that the bulk of the domestic science teachers of the future would be graduates; 80 per cent. of those in the training colleges to-day were graduates.

Miss Cowan suggested the following three lines of action:—

(1) To urge at every election of council and city authorities the importance of wiring all schools and colleges and to fit them, as far as financial circumstances permitted, with electrical equipment.

(2) To represent to the educational authorities the importance of stressing education in electricity and magnetism at an early age.

(3) To encourage throughout the country, both in connection with the women's institutes and in education circles, popular classes on the applications of electricity.

Others who took part in the discussion included Mrs. Beale (Birmingham), Mr. MacCall (Glasgow), Mrs. Dover, and Miss Vaughan (London), and Mdme. Karen Braae gave some interesting details of a night tariff in use in Denmark.

Mr. A. E. McColl, district engineer for the Central Electricity Board, then gave an address on "The Grid."

On Friday afternoon choice of three visits was offered to Yarrow's shipbuilding yard, to the Dalmarnock power station, and to the Civic and Empire Exhibition.

On Friday evening the Glasgow and District Branch entertained the delegates to a dinner at the Central Hotel, and a most enjoyable function it proved to be. All the speeches were excellent and presentations of souvenirs were made to Miss Kennedy, Miss Haslett, and to the overseas visitors.

Scottish stories and recitations were given by Mr. Gibson, of the Scottish National Players, and a memorable Conference concluded in true Scottish manner with "Auld Lang Syne."

Electricity Supply in Victoria

The Eleventh Annual Report of the State Electricity Commission

INTERESTING information with regard to the electrical development of Victoria, Australia, is given in the report of the State Electricity Commissioners for the financial year ended June 30th, 1930.

During the year under review two sections of the Commission's main extension of its supply system as authorised by Parliament in 1928, were almost completed, *viz.*, the construction of the second 132,000-V transmission line from Yallourn to Melbourne and the erection of the new terminal station at Richmond. Good progress was also made with the second power house at Yallourn (Yallourn "B"), and the first of the three 25,000-kW units of the new generating plant is expected to be ready in time for the coming winter. The Yallourn-Richmond transmission line was also put into commission.

Electricity Supply Developments

On September 1st last the Melbourne Electricity Supply Company's undertakings in Melbourne and Geelong passed into the hands of the Commission. In order to provide for the contemplated expansion of the undertaking and at the same time afford the opportunity of establishing show and demonstration rooms for the display of electrical appliances, it is proposed to erect a large building in Flinders Street as the new headquarters of the Melbourne metropolitan electricity supply undertaking. This new building will probably take twelve months to complete.

Consumers supplied by the Melbourne City Electricity Department increased by 177, making a total of 25,462 connected. There was, however, a decline of 2,298,995 kWh in sales of electricity supplied by the Department, the total energy sold amounting to 87,335,027 kWh. The maximum demand also dropped from 36,500 to 33,400 kW. Financially the undertaking showed a fall in revenue from £620,800 to £588,741; the net profit declining from £136,979 to £116,040.

The Yallourn Power Station, Australia

The agreement for the purchase by the Commission of the Ballarat and Bendigo electricity and tramway undertakings was ratified by Parliament at the end of 1929. Under this agreement the Commission will take over the undertaking on June 30th, 1934, but the present owners, the Electric Supply Company of Victoria, Ltd., will take a supply from the Commission as soon as the transmission lines are extended to Ballarat and Bendigo. It is expected that the ring main, linking up Ballarat, Bendigo and Geelong, will be completed during the current year.

To provide for the need for more suitable and extensive office and showroom accommodation at Benalla, a site was acquired for a new building in Bridge Street, but, owing to the stringency of loan funds, the erection of these new offices had to be eliminated from the programme of capital works which the Commission proposed to undertake during the year. A movement to finance the erection of the new buildings by subscription of the local residents was, however, initiated and received enthusiastic support, the whole of the money necessary being readily forthcoming. The premises were completed and formally opened in August last.

The conversion of the Castlemaine system from d.c. to a.c. was completed, and energy was made available, by means of the first section of the Ballarat-Bendigo-Geelong-Melbourne ring main, for the towns of Castlemaine, Kyneton, Woodend, Sunbury, Gisborne, Macedon, Upper Macedon, Riddell, Romsey, Lancefield, Monegeeta, St. Albans, and Diggers' Rest. The last eight places mentioned had no supply previously. The municipal undertaking of Mornington, which had been receiving a bulk supply and which was the only local undertaking remaining on the Peninsula, was acquired by the Commission shortly after the close of the financial year.

Finance

With regard to financial matters, the total revenue obtained from the supply of electricity amounted to £1,624,256, as compared with £1,427,751 in the preceding year. Expenditure on power purchased (£56,310), generating and transmission systems (£1,233,918), distribution systems (£274,133), and bulk supply expenses (£2,156) amounted, after crediting cost of power transferred to works (£12,380), to £1,554,138, as against £1,382,174, leaving a gross profit of £70,118 (£45,577). After providing for sinking fund contributions, special writings off and sundry other expenses, there was a net surplus of £10,000. Loss on operation of the brown coal mine (now closed down) accounted for £820, and this, with a loss of £3,914 on briquetting, left a net profit on all operations of £5,266, as compared with £4,614 in 1928-29. The full depreciation on the whole capital investment was included in the accounts, the amount thus charged being £275,845, as against £261,204 in the preceding year. Capital expenditure during the year amounted to £1,721,423, the principal items being £999,977 for extensions at the Yallourn works and £379,232 for the main supply system. The total now spent on the undertaking stands at £14,801,781.

There was a substantial increase in the sales of electricity, the total for all purposes rising from 358,089,467 to 394,754,454 kWh. In the metropolitan area consumers' maximum demand showed an increase of over 9 per cent., accompanied by an increase of 9.4 per cent. in the quantity of energy sold. As the period was one of severe industrial depression, during which no particularly large new blocks of power were connected, the figures emphasise the heavy and regular increase in yearly demand in the metropolitan area, which is almost entirely dependent upon the Commission's system for its supplies. The revenue per kWh in the metropolitan area rose from 0.736d. to 0.764d.

Rural Electrification

Much work has been carried by the Commission with regard to the development of its load, particularly in the rural districts. As an offshoot of its sales branch, a Rural Service Section has been constituted with a view to demonstrating the value of rural electrification and to bring as many farmers as possible within economic range of service.

Prevailing economic conditions have caused many overseas manufacturers to explore the advantages of establishing factories in Australia, and the Commission has established a specialised service to assist visitors in the problem of plant location. To assist this work further, a publication, entitled "Industrial Victoria," has been prepared, setting out in attractive and convincing fashion the pre-eminent natural and economic advantages possessed by Victoria.

Good progress was made in connection with the sale of domestic electrical appliances, and during the year most of the country branch offices were converted into active showrooms for the display of apparatus. Figures for the number of domestic appliances connected were considerably higher than those recorded in any previous year. Although electric irons continued to be the most popular appliances (the number connected during the year rising from 2,747 to 9,294), there was a remarkable increase in the number of kettles and vacuum cleaners connected, the totals being, respectively, 4,488 (as against 488 in 1929-29) and 2,447 (231). Other appliances connected during the year were: Radiators, 2,246 (1,479); grillers, 1,466 (225); toasters, 837 (85); fans, 765 (205); and cookers 745 (344).

The Yallourn Station

The principal station of the Commission, the Yallourn "A," continued to operate satisfactorily and attained a maximum load of 61,000 kW. Electricity generated at this station totalled 301,806,830 kWh, and in addition 8,822,670 kWh was purchased from the briquetting factory, making a total of 310,629,500 kWh. This output, which is a little higher than that of the previous year, represents a load factor of 57 per cent., which is also slightly in advance of the preceding year's figure. The development of firing equipment, aiming at increasing the output of the boilers when employing high-moisture coal, was proceeded with, and several adjustments and alterations to apparatus were made. In the planning of the boiler plant for the extended station (Yallourn "B"), several new avenues have been explored, and it is anticipated that the new boilers will register an even better performance in the combustion of raw brown coal than those already recorded.

Investigations into the water power resources of the State were continued during the year, schemes offering favourable prospects for early development receiving special attention. Work on the Kiewa scheme was supplementary to previous investigations, and included borings to test the rock formation at possible dam sites. The possibilities of the Hume reservoir, which is due for completion in 1932, were also closely studied.

Business and Industrial Notes

The Week's Electrical Trade News from all Sources. Commercial and Industrial Developments, Business Changes, Market Prices for Materials, Trade Openings, New Publicity Literature, Liquidations, and Failures

"Electrical Review" Index

The Index to Vol. CVIII (for the half-year ending June 30th, 1931) is in course of preparation and will be published shortly. We shall be glad to receive the names and addresses of those who require it (free of charge) for binding purposes, or wish to retain it for reference. Application should be made as early as possible to the Publisher, 4, Ludgate Hill, E.C.4.

Wages in the Engineering Industry

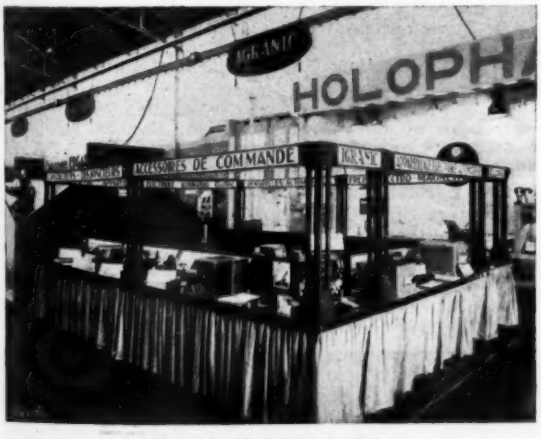
At the conference between representatives of the Engineering and Allied Employers' Federation and the 40 unions connected with the engineering industry on Thursday last week, Sir Allan Smith, chairman of the Federation, announced that the employers had decided to put into force on July 6th the alterations in wages and conditions which they had placed before the unions at earlier conferences. The proposals are, briefly, as follows:—Piece rates to be reduced from 33⅓ per cent. to 25 per cent. above the basic rate. Time-and-a-quarter for the first three hours of overtime and time-and-a-half thereafter, instead of time-and-a-half up to midnight and double time thereafter; the existing limit of 30 hours' overtime in four consecutive weeks is to remain. The rate for night shifts is to be time-and-one-sixth for 52 hours' work, and time-and-a-half for overtime, instead of time-and-a-third for all time worked up to 47 hours and time-and-two-thirds after this. Under the two- and three-shift systems, the first shift is to be paid plain time rates for 43 hours, and the second and third shifts at time-and-one-eighth for 37½ hours. Under an agreement made in 1920 the first shift has consisted of 43 hours' work for which 47 hours has been paid; the second and third shifts have consisted of 37½ hours' work and the payment has been for 47 and 50 hours, respectively. The employers originally asked for the extension of the working week from 47 to 48 hours but later abandoned this proposal.

An Electric Tractor Battery

Referring to the note on "A New Electric Tractor" in our issue of May 29th (p. 925), the D.P. BATTERY CO., LTD., states that the battery employed in this vehicle is of its manufacture. The battery comprises 40 cells of the "Kathanode" type, with a capacity of 540 Ah. During the trials the charging has taken place at the company's service depôt, 107a, Pimlico Road, S.W.

Igranic at the Paris Fair

The IGRANIC ELECTRIC CO., LTD., was one of the British exhibitors at the recent Foire de Paris. A representative selec-



An Igranic Exhibit in Paris

tion of its control equipment and other products was displayed; a view of the stand appears with this note.

Guides to the Baltic States

Three of the Baltic States are the subject of the latest "Hints for Commercial Visitors," published by the Department of Overseas Trade. They deal, respectively, with Finland (C.X. 3552), Estonia (C.X. 3558), and Denmark (C.X. 3561), and in all of them detailed information is given upon the way to get to the countries, means and cost of transport, hotel accommodation, &c.

Recent Contracts

Messrs. CROSSLEY BROS., LTD., inform us that the Bridport Electricity Works has ordered from them a five-cylinder 325-b.h.p. engine for driving an electric alternator; a three-cylinder Crossley engine is to operate near Beaumaris in the Dinmoor Park Quarries of the Minerals Construction Co., Ltd.; and the Government Boot Factory at Carlow, I.F.S., has ordered a three-cylinder set for dynamo drive.

Messrs. BLACKSTONE & CO., LTD., have recently received an order from the Preston Corporation for an automatically-controlled plant consisting of three 16-in. and two 12-in. "Unchokeable" pumps for the handling of unscreened sewage, together with motors totalling 835 b.h.p., complete with switchgear, pipes, &c. The value of the contract is £5,860.

The BRUSH ELECTRICAL ENGINEERING CO., LTD., has received an order for two 1,250-kW Brush-Ljungstrom turbo-alternators from the municipality of King William's Town, South Africa.

Price Reductions

W. T. HENLEY'S TELEGRAPH WORKS CO., LTD., announces substantial reductions in the prices of a number of accessories for use with its wiring systems.

A Large Broadcasting Battery

The CHLORIDE ELECTRICAL STORAGE CO., LTD., has supplied battery equipment for the B.B.C. Northern Regional Station at

A Chloride Battery at Moorside Edge

Moorside Edge. A part of this is illustrated herewith, the battery shown being a 115-cell, 2,000-Ah set.

Telephone Contracts in South Africa

The South African Minister of Posts and Telegraphs has replied to a series of questions asked in the House of Assembly regarding the placing of contracts for automatic telephone exchanges. The gist of his reply is that quotations were asked through the High Commissioner in London from all manufacturers able to supply the special apparatus required. Ericsson Telephones, Ltd., Standard Telephones and Cables, Ltd., and the British General Electric Co., advised him of their willingness and ability to quote, but he learned that these firms could not supply this equipment to South Africa without infringing patents and breaking agreements. The three firms to whom orders had been given (Siemens Bros. & Co., Ltd., the Automatic Telephone Manufacturing Co., Ltd., and Siemens and Halske) had an agreement with regard to the common use of their patents. Orders had been placed for automatic switch equipment with Siemens and Halske and for subscribers' telephones with Siemens Bros. (British). The new automatic exchange at East London would cost about £25,000, in addition to cable connections, installation, &c. At Johannesburg and Cape Town, although orders had not been placed for all the apparatus, it was estimated that the total cost of the present programme in sight was about £475,000 and £123,000 respectively. This was about £150,000 less than the original estimate, due to advantages gained in the course of manufacture and in other directions.

Reconstruction in New Zealand

MR. H. E. TAYLOR, the New Zealand manager of the British General Electric Co., Ltd., recently visited the area devastated by the earthquake, and has written home to say he was not only astounded by the damage done but just as much by the way the victims were endeavouring to get going again. In Napier he found the Power Board authorities working almost round the clock in order to restore the electricity supply. Everyone was in any sort of temporary office and the first building which he saw being erected—temporary bank quarters built of wood and iron—was illuminated by "Osram" lamps.

The Timber Market

Our Timber Trade Correspondent reports that the metropolitan trade in the European varieties during the past month has been of moderate compass only. Receipts are very small this year, whilst the stocks on hand are by no means large. In the higher class woods stocks of logs in brokers' hands are low, especially of mahogany and teak. In the cheaper American sawn woods supplies in this country are large and prices are weak. The volume of plywood imports has been cut very closely this year, and it is likely that more firmness will rule on the spot market than has been apparent so far this year. As a general rule, timber prices are lower than they were a year ago.

A New " Sperry " Factory

The SPERRY GYROSCOPE CO., LTD., has just completed a new factory, which includes the head office, at Brentford, on the Great West Road, and this is now the headquarters for the whole of the administration and manufacturing of the company. Fronting the main road is the office building. The commercial and administrative departments occupy the whole of the ground floor. The upper floor accommodates the engineering department, drawing office, research department, and a demonstration room where the company's products are on view and where courses of instruction can be given. The factory is immediately behind the main office building, and covers a total area of several acres. The greater part of this, on ground level, and the central expanse of the shop, is devoted to manufacture, assembly, and testing. Bays partitioned off down either side accommodate the stores and shipping department, and the painting and finishing sections, respectively.

Birmingham Electrical Contractors at the B.T.-H. Works

The F.B.I. on Land Taxation

A letter has been addressed to the Prime Minister, Mr. Baldwin, and Mr. Lloyd George by the Federation of British Industries setting forth the Federation's objections to the Government's proposals for the taxation of land values. Such a tax is condemned as adding a further burden to industry, and the Federation announces its intention of introducing amendments aiming at exempting industries from the provision of the Bill, or, at least, exempting land used for industrial purposes so long as it continues to be so used.

An E.A.W. Works Visit

Last week members of the recently-formed Liverpool Branch of the Electrical Association for Women paid a visit of inspection to the works of the Automatic Telephone Manufacturing Co., Ltd., in which between five and six thousand people are employed. A tour was first made of the Strowger works where the intricate processes of automatic telephone manufacture were seen, including the construction of the new 30,000-line Mayfair (London) exchange. The visitors then passed on to the Victor works in which the domestic appliance side of the company's business is carried on. Naturally this proved of even greater interest to them than the telephone manufacturing shops. We reproduce a photograph of some of the ladies in the " Xcel " domestic appliance showroom and a view of the cooker assembling factory. Particular interest was evinced in the vitreous enamelling process applied to the cookers. During the visit our representative was shown a historic iron by Mr. C. Archer, the heating engineer. It was one which he designed 35 years ago and had been in service up to about 18 months ago. The party included Mrs. R. L. Burns (the chairman of the branch), Mrs. P. L. Davies (secretary), Mr. P. J. Robinson, city electrical engineer, Liverpool, and Mrs. Robinson.

In the " Xcel " Showroom

The " Xcel " Cooker Factory

Municipal Trading in South Africa

The Town Council of Oudtshoorn, South Africa, has decided to discontinue trading in electrical goods as from January 1st, 1932. The mover of the resolution maintained that the Council had been trading as shopkeepers, which was unfair competition with the legitimate trader.

Contractors at B.T.-H. Works

On June 1st members of the Birmingham branch of the Electrical Contractors' Association visited the B.T.-H. works, Rugby. They were received by Mr. H. A. Lingard, a director, and Mr. H. N. Sporborg, director and chief engineer, and after luncheon they inspected the " Mazda " lamp factory, the heavy machine shops (where they saw a 50,000-kW turbine for the West Midlands J.E.A. under construction), the transformer department and the controller factory. They were then entertained to tea and later attended a demonstration of the company's talking film equipment in the Acoustical Laboratory. A photograph taken at the works accompanies this note.

Canadian Import Duties

A new heading is raised in the Customs tariff amendments introduced into the Canadian House of Commons on June 1st. This is " Electric steam turbo-generator sets of 700 h.p. or greater, of a class or kind not made in Canada, and parts thereof." Under the British preferential tariff these are admitted free of duty. The duty under the intermediate tariff is 15 per cent. *ad valorem*, and under the general tariff 20 per cent.

Expected Expansion in Canada

In the course of a review of Canadian conditions, a Montreal correspondent of *The Times Trade and Engineering Supplement* says that preparations which are being made by manufacturing and commercial interests for an enlarged volume of business indicate confidence in the Canadian situation. Among other things, the Canadian Westinghouse Co. is said to be extending its distributing organisation and expects ultimately to operate through 2,000 retail outlets in the Dominion.

Trolley-'bus Equipment in Germany

In view of the increasing demand for electric trolley-'buses in Germany, the Brown-Boveri Co., of Mannheim, has recently taken up the construction of the electrical equipment for such vehicles, and is also arranging for a short route over which demonstrations of trolley-'bus working can be given.

German Radio Apparatus Combination

It is reported from Berlin that the A.E.G., the Siemens and Halske Company and the Telefunken Company are negotiating for the amalgamation of their radio departments. Under the proposed arrangement the manufacture of apparatus would be concentrated in the hands of the first two companies, while the last concern would handle the sales business and would discontinue manufacturing.

For Sale

Tenders are invited for the purchase, dismantling and removal of transformers, switchgear, instruments, &c., from the General Post Office (South) Knightrider Street sub-station, London.

Messrs. Alaway & Partners invite tenders offers for the stock, plant, and machinery in the Waltham Abbey factory of Messrs. Everlite, Ltd., now in voluntary liquidation.

(See our advertisement pages to-day.)

Local Exhibition

The Electrical Distribution of Yorkshire, Ltd., has been holding an exhibition of domestic electrical appliances at Liversedge this week for the benefit of Spen Valley consumers. Daily demonstrations of electric cooking, washing, &c., have been given.

Nearly 1,800 persons attended the demonstrations given by the South Shields Electricity Supply Department in its model kitchen at the Industrial Trades Exhibition held recently at the Spa Skating Rink. This kitchen was one of three model rooms of an all-electric bungalow which formed the exhibit of the Department, the other rooms being a lounge and a bedroom. Every type of domestic electrical apparatus was displayed, the artistic decoration of the stands permitting each article to be shown to its best advantage. The Department was assisted by the General Electric Co., Ltd., in carrying out the arrangement of its exhibits.

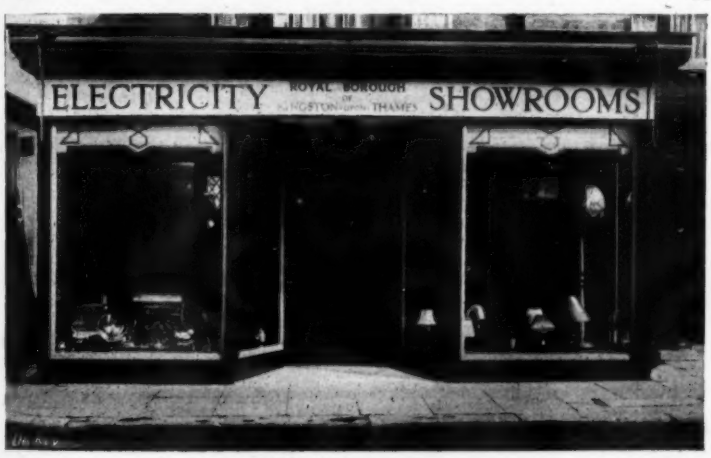
New Municipal Showrooms

If a pleasant appearance and artistic decorations can make electricity showrooms a success, there can be no doubt about the future of those of the Kingston-upon-Thames Electricity Department, which were opened last week at 17, High Street, Kingston. In spite of excellent progress made in recent years, the Department has for some time been considerably handicapped by having inadequate office accommodation. The new premises, in addition to supplying this want, will give the Department an opportunity of further developing its activities in the sale of domestic appliances. Although the main structure of the building is not completely new, the whole of the exterior and interior have been reconstructed and the result obtained, besides being artistic, is both businesslike and effective. On entering the building we find ourselves in a large room divided into two parts, the front and larger being devoted to the display of fires and wall fittings, and the rear one to cookers, irons and general domestic appliances. Passing from the front room through a lounge hall we come to a lounge, tastefully decorated in cream and gold, wherein are displayed a selection of wall fittings and standard lamps; it is proposed from time to time to change the character of this room as occasion demands. At the rear of the building are a model bathroom and kitchen. Arrangements are made in the latter for the demonstration of cookers, washing machines, water-heaters, polishers, &c. The whole of the floor above is used as offices. An illustration of the exterior appears above.

The other illustration shows a corner of the electricity showrooms opened recently by the Cheadle and Gatley Urban District Council—a light and airy apartment. The new premises are situated in the main thoroughfare and have a simple but attractive double-front, the windows of which provide ample display space. A good selection of apparatus of all kinds has been arranged and demonstrations are given at frequent intervals.

The Cheadle and Gatley Showrooms

The Council has in operation an assisted wiring scheme, a hiring scheme for cookers and fires, and a hire-purchase scheme for other appliances which have met with considerable success.



Kingston's New Showrooms

Novel Church Lighting

The illustration reproduced with this note shows what is believed to be the first church-lighting scheme carried out by means of tubular fittings. This type of fitting is having something of a vogue; its use in ecclesiastical surroundings, although a new departure, is not incongruous, for it is reminiscent of the candles which were displaced by other means of illumination a long time ago. The church in question is the Lindley Parish Church, Huddersfield. The Fittings Department of the Sun Electrical Co., Ltd., was asked to design suitable lighting fixtures and it was decided that the circumstances afforded an excellent opportunity for the use of the new tubular opal lamps. To this end special fittings were designed and constructed of wrought iron, finished in jade green with tubular suspensions in place of the customary chain. Lamps of 40 W each were used throughout, and an excellent, glareless illumination has been obtained, combined with an "atmosphere" suitable for a place of worship.

The light stone-coloured walls receive the volume of light in the horizontal plane, and then distribute it over the church almost like daylight from windows.

Tubular Fittings in a Church

The church, which is on the top of a hill, contains some beautiful stained glass, and the effect of these fittings is such that at night it presents a picturesque spectacle. Not only is the church proper equipped with fittings of the design illustrated, but there are smaller similar units in the vestibules and entrances. The installation has been carried out by the Drummond Hurst Electrical Co., of Huddersfield.

The Sun Company is engaged on several interesting electric light fittings contracts, one of which is the designing and supplying of all the special gas and explosion-proof fittings, fuse-boards, &c., for the large extension of the Beckton Gas Works of the Gas Light and Coke Co. It has also recently supplied the whole of the electric lighting equipment and exterior floodlights for the new super power station at Kirkstall, Leeds.

Social Events

Once again, in spite of threatened meteorological depressions, fine weather favoured the annual sports meeting of the London establishments of the General Electric Co., Ltd., which was held on Saturday last at the company's sports ground, Preston Road, Wembley. The popularity of these meetings shows no signs of abating and a large gathering of employés and friends was present to give vocal encouragement to the many competitors. The list of events was a long and varied one, and the keen inter-departmental rivalry, which kept every competitor "on his toes," was responsible for some exciting finishes. The side-shows, always a feature on these occasions, were original, and attracted considerable support. Immediately after the conclusion of the programme of events, the many challenge cups and prizes were distributed by Mrs. M. J. Railing, and Mr. M. J. Railing spoke briefly of the sporting spirit of the company as a whole, which he said had materially helped it to reach the position it held in the electrical industry. In the evening a concert was given by blind artistes in support of the Greater London Fund for the Blind, and a pleasant day was concluded with dancing on the green. The musical programme during the afternoon was "broadcast" by "Gecophone" orchestral equipment.

The first annual sports meeting of the Sun Electrical Co., Ltd., was held at the company's ground, Enfield, on May 30th. Except for a short spell of rain, the weather conditions were good, and there was a large number of entries for the many and varied events. Among those present were Mr. A. G. Beaver, managing director, Mrs. Beaver, Mr. D. M. Fraser (Leeds branch manager), and Mr. J. K. Green (Newcastle branch manager). The prizes were presented by Mrs. A. G. Beaver on June 4th at Sunco House.

The fifth annual competition, held under the auspices of the Liverpool and District Electro-Harmonic Society, for the Allied Electrical Trade Golf Challenge Cup, was held on June 9th on the links of the Southport and Ainsdale Golf Club. The tournament was restricted to members of the allied electrical trades within 25 miles of the Liverpool Town Hall, the trophy being awarded to the competitor returning the best net score.

Book Notices

"Talking Pictures and Acoustics," by C. M. R. Balbi, with a foreword by Sir Oliver Lodge. Pp. v+123; figs. 72. London: The ELECTRICAL REVIEW. Price 7s. 6d. net.

We have received from Messrs. Chapman & Hall, Ltd., a 167-page catalogue of technical and scientific books. Nearly a thousand book titles are included, electrical engineering being well represented. Both subjects and authors are indexed.

The Siemens Magazine (the employés' journal of Messrs. Siemens Bros. & Co., Ltd.) has been enlarged by the inclusion of an engineering supplement. There are four pages of this in the June issue, and they contain illustrated articles on the "Siemens" automatic telephone system in Hong Kong, &c.

"Examples of Power Distribution and Electric Traction," by A. T. Dover. Pp. x+80; figs. 14. London: Sir Isaac Pitman & Sons, Ltd. Price 3s. 6d. net.

Trade Announcements

The NEW DISTRIBUTORS OF EDISON STORAGE BATTERIES, LTD., have shortened their name to EDISON STORAGE BATTERY DISTRIBUTORS, LTD. The head office of the company will be as before, Victoria House, Southampton Row, London, W.C.1, and the telephone numbers (Holborn 6673/4) are unchanged.

MR. S. W. PINK has commenced business at Queenville, Herne Avenue, Herne Bay, with a department for electrical installation work.

ELECTRICAL EQUIPMENT & CARBON CO., LTD., has opened a branch office and stores at 71, Upper Parliament Street, Nottingham (telephone: Nottingham 2952 and 68090), under the management of Mr. E. Pickbourn.

The London office of Messrs. GENT & Co., LTD., has been removed to 47, Victoria Street, S.W. The telephone number and telegraphic address are unchanged.

New Catalogues and Lists

F. GILMAN (B.S.T.), LTD., 221, High Street, Smethwick.—An illustrated catalogue containing a complete list of the company's flexible drive tools for polishing, drilling, filing, grinding, milling, &c.

The MARCONIPHONE CO., LTD., 210-212, Tottenham Court Road, London, W.1.—The May issue of the "Marconiphone Mail," giving particulars of the company's summer sales campaign, also a syllabus of the second "Marconiphone" dealer-training scheme, and a window bill issued in connection with the forthcoming visits of the "Marconiphone" mobile amplifier.

The FOSTER ENGINEERING CO., LTD., Apex Works, Wimbledon, London, S.W.19.—A 44-page illustrated and priced catalogue (D.30) of "Apex" switch- and fuse-gear.

FESCOL, LTD., 101, Grosvenor Road, Westminster, London, S.W.1.—Booklet No. 23, giving a detailed description, with illustrations, of the many applications of the "Fescol" process of electro-chemical deposition of metals.

HAILWOOD & ACKROYD, LTD., Morley, near Leeds.—Leaflets dealing with "Hailware" architectural lighting fittings (H.W. 35/2), advertising glassware and fittings (H.W. 50/2), and glass angle and V-shape sections, moulded panels, cylinders, square tubes, boxes, &c. (G.W. 129/1).

E. K. COLE, LTD., Southend-on-Sea.—A circular referring to the "Ekco" summer sales campaign.

BROOKHIRST SWITCHGEAR, LTD., Northgate Works, Chester.—An illustrated booklet describing an automatic system of street lighting control.

The MIDLAND ELECTRIC MANUFACTURING CO., LTD., Barford Street, Birmingham.—A folder giving details of the new "Memajor" switch for installations rated at 30 amps., 250 volts.

BAXTER & CAUNTER, LTD., 221, Tottenham Court Road, London, W.1.—The June issue of the company's electrical accessory list.

JAMES KEITH & BLACKMAN CO., LTD., 27, Farringdon Avenue, London, E.C.4.—A leaflet relating to "Keith-Blackman" fans, dust-removal plant, air and gas compressors, air-washing plant, &c.

KEENOK GEARS, LTD., Oaklands Road, London, N.W.2.—Particulars and prices of the seven standard grades of "Keenol" oils and greases.

The REVO ELECTRIC CO., LTD.—Catalogue (No. F.9) of the new season's electric fans.

ATELIERS DE CONSTRUCTIONS ELECTRIQUES DE CHARLEROI, 56, Victoria Street, London, S.W.1.—List 1341/24 relating to "A.C.E.C." rubber-insulated trailing cables.

SIEMENS BROTHERS & CO., LTD., Woolwich, London, S.E.18.—Leaflet 2,068, illustrating and describing house service fuse boxes.

Prices of Materials

The following prices are only general, and they may vary according to quantities and other circumstances:—

	CHEMICALS, &c.	Price June 9th.	Fortnight's inc. or dec.
a	Acid, Oxalic ... ... per lb.	5¾d.	...
a	Ammoniac, Sal ... ... per ton.	£60	...
a	Ammonia, Muriate (large crystal) ,,	£62	...
a	Borax ... ... ,,	£17	...
a	Copper Sulphate ... ... ,,	£25 10s.	...
a	Potash, Chlorate ... ... per lb.	3d. to 4d.	...
a	,, Perchlorate ... ... ,,	5½d.	...
a	Shellac T.N.... ... ... per cwt.	£4 5s.	...
a	Sulphur, Commercial ... ... ,,	£11	...
a	,, Roll ... ... ,,	£11	...
a	Soda, Chlorate ... ... per lb.	3d.	...
a	,, Crystals ... ... per ton.	£5 to £5 5s.	...
a	Sodium Bichromate, casks ... per lb.	3½d.	...
	METALS, &c.		
b	Aluminium, Ingots ... ... per ton.	£85 to £90	...
b	,, Wire ... ... per lb.	1/1 to 1/9	...
b	,, Sheet and Foil ... ,,	1/1 to 2/9	...
b	Babbits Metal and Anti-friction Metals—		
	Grade I ... ... per ton net.	£105	...
	Grade II ... ... ,,	£76	...
	Grade III... ... ... ,,	£46	...
c	Brass (rolled metal 2" to 12" basis) per lb.	7¼d.	¼d. dec.
c	,, Tubes (solid drawn) ... ,,	9½d. to 9¾d.	...
c	,, Wire, basis ... ... ,,	7¾d.	¼d. dec.
c	Copper Tubes (solid drawn) ... ,,	10¼d.	¼d. dec.
g	,, Bars (best selected) ... per ton.	£70	£3 dec.
g	,, Sheet ... ... ,,	£70	
g	,, Rod ... ... ,,	£70	
d	,, (Electrolytic) Bars ... ,,	£49 12s. 6d.	...
d	,, ,, Sheets ... ,,	£143 10s.	...
d	,, ,, Wire Rods ,,	£59 12s. 6d.	...
d	,, ,, H.C. Wire per lb.	7⅞d.	...
f	Ebonite Rod ... ... ,,	2/3 to 2/6	...
f	,, Sheet ... ... ,,	2/3 to 2/6	...
n	German Silver Wire ... ... ,,	2/1	...
h	Gutta-percha, fine ... ... ,,	nom	...
h	India-rubber, Para fine ... ... ,,	4½d.	½d. dec.
i	Iron, Pig (Cleveland No. 3) ... per ton.	58/6	...
l	,, Wire, galve. No. 1, P.O. qual. ,,	£20	...
g	Lead, English pig ... ... ,,	£12 5s.	10s. dec
g	Mercury ... ... per bot.	£17s. to £17 10s.	£5 to £5 7s. 6d. dec.
e	Mica (in original cases) small ... per lb.	6d. to 3/6	...
e	,, ,, medium ,,	4/- to 8/-	...
e	,, ,, large ... ,,	3/6 to 17/6 & up	...
p	Phosphor Bronze, plain castings ,	1/1½d.	...
p	,, ,, drawn bars & rods ,,	11¼d.	...
p	,, ,, rolled strip & sheet ,,	1/0d.	...
p	,, ,, wire ... ... ,,	1/0¼d.	...
o	Platinum ... ... per oz.	£8	£2 12s. 6d. inc.
d	Silicium Bronze Wire ... ... per lb.	9½d.	...
r	Steel, magnet, in bars ... ... ,,	7¾d.	...
g	Tin, Block (English) ... ... per ton	£102 to £108	£1 5s. dec.
n	Wire, Nos. 1 to 16 ... ... per lb.	2/11d.	...

*For 1 cwt. lots. Special quotations against definite specifications.

Quotations supplied by

a G. Boor & Co.
b The British Aluminium Co., Ltd.
c Thos. Bolton & Sons, Ltd.
d Frederick Smith & Co.
e F. Wiggins & Sons.
f India-Rubber, Gutta-Percha and Telegraph Works Co., Ltd.
g James & Shakespeare.
h Edward Till & Co.
i Bolling & Lowe.
l Richard Johnson & Nephew, Ltd
n P. Ormiston & Sons.
o Johnson, Matthey & Co., Ltd.
p C. Clifford & Son, Ltd.
r W. F. Dennis & Co.

New Indian Companies

Among the concerns recently organised in India are the Riverside (Bhatpar) Electric Supply Co., 135, Princep Street, Calcutta, capital 2,50,000 rupees; the Sangor Electricity Supply Co., 12, Mission Row, Calcutta, 7,50,000 rupees; and the Chittoor Electric Supply Co., Ayyanga, Chittoor, Madras, 2,00,000 rupees.

Bankruptcy Proceedings

H. D. SMITH, trading as the Standard Radio and Electrical Co., 4a, Alpha Road, Surbiton.—The receiving order herein was made on May 14th on a creditor's petition. The statement of affairs shows liabilities of £3,427 and assets of £299, leaving a deficiency of £3,128. The debtor states that in 1927 he commenced business in partnership with another as radio manufacturers; in the same year his partner retired, and he continued the business alone. In 1929 the business was transferred to a limited company for a consideration of 99 £1 shares therein, and debtor was appointed a director. In June, 1929, another company was formed to take over the existing company, and the debtor was allotted 150 £1 shares for his interest. In November, 1929, he sold his shares and resigned his directorship, and in September, 1930, he took over the business of his employers, the Standard Radio Electrical Co. The business was successful but required further capital, and the debtor approached various persons with the intention of forming a limited company but without result. A meeting of his creditors was subsequently held, when an offer of 5s. was made and refused. The debtor was unable to increase the offer, and in February last executed a deed of assignment of his property in favour of a trustee. He attributes his failure to lack of capital and under-estimating costs of production.

P. W. OTTOWAY (Victor Radio Supplies), wireless dealer, 73, Victor Street, Great Grimsby.—Receiving order made May 29th, on debtor's own petition. First meeting, June 12th, at the Official Receiver's office, St. Mary's Chambers, Great Grimsby. Public examination, July 2nd, at the Town Hall, Great Grimsby.

H. D. SMITH (Standard Radio & Electrical Co.), factor, 4a, Alpha Road, Surbiton.—First meeting held June 10th at Bankruptcy Buildings, Carey Street, W.C. Public examination July 14th at the Police and County Court, Kingston-on-Thames.

A. K. E. STRATHDEE (Emsco Radio), electrical engineer, 923, Romford Road, Manor Park, E.—Last day for receiving proofs for dividend, June 17th. Trustee, Mr. F. Vyvyan, Bankruptcy Buildings, Carey Street, W.C., Official Receiver.

F. W. CASSELL (F. W. Cassell & Co.), electrician, 164, Park View Road, Welling.—First meeting, June 12th, at the Official Receiver's office, 280a, High Street, Rochester. Public examination, June 15th, at the Court House, Eastgate, Rochester.

R. BLOOD, wireless dealer and electrician, 44 and 46, Station Road, Padiham.—Application for discharge to be heard on July 30th at the County Court House, Bankhouse Street, Burnley.

H. E. DAFT, electrical engineer, Gloucester Place, Monument Street, Peterborough.—Application for discharge to be heard on July 8th at the Law Courts, Peterborough.

A. C. DOBBING and A. L. ROTHERY (Ripon Electrical Co.), electrical engineers, 39, Kirkgate, Ripon.—Trustee, Mr. D. S. Mackay, Duncombe Place, York, Official Receiver, released May 8th.

E. W. WOOD, electrical engineer, 69b, Kettering Road, Northampton.—Trustee, Mr. T. Bengough, 6, The Parade, Northampton, Official Receiver, released May 20th.

E. J. MELVILLE (James Melville & Co.), electrical contractor, Sutherland House, Forest Road, Nottingham.—Trustee, Mr. A. L. West, 22, Regent Street, Park Row, Nottingham, Official Receiver, released May 20th.

Company Liquidations

ENTERPRISE MANUFACTURING CO., LTD., 27 and 28, Finsbury Square, E.C.—The statutory first meetings of creditors and shareholders were held on June 5th at London Bankruptcy Buildings before Mr H. P. Naunton, Assistant Official Receiver. The compulsory winding up order was made on April 27th last upon the petition of the Mullard Wireless Service Co., Ltd. The chairman reported that the company was formed in July, 1917, with a nominal capital of £5,000 (of which £4,452 had been issue) to carry on business as electrical merchants and dealers. The business appeared to have been founded by H. Ashdown, in 1909, under the style of the Enterprise Electrical and Manufacturing Co., and C. H. Roberts became connected with the firm in 1913. The company purchased the assets and goodwill of the business for £3,000 in shares. In order to provide the necessary working funds, further capital was advertised for, and £500 was invested by S. Dicks, who became sales representative of the company for the provinces. Later, a further £500 was provided by E. Joseph, who subsequently bought the holdings of Ashdown and Dicks. Roberts was appointed managing director of the company. During the early part of 1923 the company was in need of further capital, and arrangements were made for an overdraft of £2,000, which was secured by a debenture bond. On August 8th, 1929, Mr. P. Leask was appointed receiver and manager on behalf of the debtor holder, and he continued to carry on the business until May 23rd, 1930, when he sold the assets for £1,295. A resolution for voluntary liquidation was passed in the following July, with Mr. Leask acting as liquidator. A statement of affairs had been lodged showing total liabilities of £9,159, of which £7,150 was expected to rank for dividend, against net assets of £2,889. The account with the contributors disclosed a deficiency of £8,711. The failure of the company was attributed to over-trading, heavy overhead expenses, and shortage of capital. A resolution was passed for Mr. H. Bell to act as liquidator. The following are the principal creditors:—

	£		£
W. Balmford	145	Marconiphone Co., Ltd.	130
A. C. Cossor, Ltd. ...	311	Mullard Wireless Service Co., Ltd.	667
Dubilier Condenser Co., Ltd.	105	Pope's Electric Lamp Co., Ltd.	114
Electric Cable Co. ...	206	Philips Lamps, Ltd. ...	183
Edison Swan Electric Co., Ltd.	613	E. & C. Straker, Ltd. ...	120
J. Godden & Co.	142	Siemens Bros. & Co., Ltd.	149
F. A. Hughes, Ltd. ...	104		

R. C. SEAL & CO., LTD.—At a meeting held on May 4th, the shareholders approved the voluntary winding up of the company and the appointment of Mr. R. W. Metcalfe of Messrs. Oldham Holland and Co. as liquidator. A creditors' meeting held on the same day resolved that Mr. E. H. Hawkins, 4, Charterhouse Square, E.C., be appointed to act as liquidator, with a committee of inspection.

ATKINSON & PAYNES, LTD.—Meetings on July 3rd at 159, Great Charles Street, Birmingham, to receive an account of the winding up by the liquidator.

Mr. R. Pitt, director and secretary of Edward Holme & Co. (1931), Ltd., Moss Lane, Altrincham, has sent us the following letter:—"We shall be glad if you will kindly refer to the insertion of the liquidation of Edward Holme & Co., Ltd., on page 887 of your issue of May 22nd, and to the notice appearing on page 969 of your current issue under the heading "Returns of Electrical Companies," regarding the new company. We should like the position to be made clear in the interests of the new company.

"Owing to the death of our chairman, Capt. W. C. Bacon, it was necessary to wind up the old company voluntarily and to form a new company under the name of Edward Holme and Co. (1931), Ltd. This private company was registered on May 11th with a capital of £10,000 in £1 shares, to acquire the business of Edward Holme & Co., Ltd., electrical and mechanical engineers. The first three directors are Messrs. W. Clarke, R. Pitt, and R. H. Fawcett, all of Moss Lane, Altrincham. Mr. James Robinson, of Liverpool, is also appointed a director as nominee of the trustees of the late chairman."

Winding-up Petitions

In the Companies Court on Monday last, Mr. Justice Maugham adjourned for four weeks the petition for the compulsory liquidation of Aeonic Radio, Ltd., and also the petition of Henrion Carbons, Ltd., for the compulsory liquidation of Electrical & Radio Products, Ltd., with which the first-named company had agreed to enter into a scheme of arrangement. Mr. Gedge, for the petitioners in the first case, said the petition arose out of the fact that the scheme had not been carried out. Mr. Evershed, for Aeonic Radio, Ltd., said the difficulty had been caused by the petition against the second company, with regard to which a scheme of arrangement was to be brought before the Registrar on the following day. Mr. Wynn Parry, representing the General Electric Co., Ltd., Mullard Wireless Service Co., Ltd., and the Muller Accumulator Co., Ltd., who were appointed a creditors' committee to report on the schemes. They had not been able to do so, and he asked for an adjournment for this purpose. His Lordship adjourned the petitions as stated.

LOUD SPEAKER CO., LTD.—A petition for the winding up of this company has been presented to the High Court by the Islington Metal and Plating Works, Ltd., and will be heard in London on June 15th.

Private Arrangements

W. H. LAWTON, LTD., Stoke-on-Trent, wireless and electrical dealers.—A meeting of creditors was held recently, when a statement of affairs prepared by Mr. P. Ferneyhough, 6, Commerce Street, Longton, was submitted, which disclosed liabilities of £3,253 and net assets of £1,923, leaving a deficiency of £1,330. The company was formed in April, 1930, with a nominal capital of £750. It was estimated that the stock was likely to produce £1,000 if sold in the ordinary way of business. According to a balance sheet as at December last there was a deficiency of £930. It was decided that a debenture should be issued to Messrs. M. P. Ferneyhough and F. E. Bendall, as trustees for the creditors, to secure a composition of 15s. in the £, payable as to 7s. 6d. in the £ at December 31st, 1931, and 7s. 6d. in the £ on June 30th, 1932. All creditors for less than £10 are to be paid a composition of 15s. in the £ by July 30th, 1931.

H. G. BUTT, Lower Bull Ring, Cullompton, radio engineer.—The creditors in this matter met recently, when it was reported that the liabilities were £891 (all due to the trade), while the assets were estimated to realise £496, leaving a deficiency of £395. It was decided that the matter should be dealt with under a deed of assignment, with Mr. W. J. Thorne, Cullompton, as trustee, with a committee.

Electricity Supply

Lighting, Domestic, Power

Accrington.—YEAR'S WORKING.—The report of the Corporation Electricity Department for the past year shows a total income of £80,714 (a decrease of £1,418) and a working expenditure of £41,008, leaving a gross profit of £39,706. The net profit declined from £6,886 to £1,527 but a sum of £1,880 was paid out of revenue for capital expenditure in excess of borrowing powers. The total sales of electricity amounted to 17,853,263 kWh, a decrease of 54,352 kWh.

Algeria.—NEW GENERATING STATION.—The Société Constantinoise d'Energie Electrique (formerly the Compagnie du Bourbonnais) which has operated a 4,800-kW steam-operated power station for several years, has recently secured the contract to supply the power necessary for the railway between Ould Keberit, Duvivier, and Bone, which is being electrified. To meet the increased demand, it has been decided to erect a new power station at Bone, which when fully developed will have a capacity of 75,000 kW and will be the largest in North Africa. Turbo-generator sets aggregating 40,000 kW will be installed initially.

Baildon (Yorks.).—STREET LIGHTING.—The Urban District Council has adopted a scheme submitted by the Electrical Distribution of Yorkshire, Ltd., for the conversion of all the street lamps from gas to electricity.

Barrow-in-Furness.—YEAR'S WORKING.—The annual report of the borough electrical engineer (Mr. H. R. Burnett) on the working of the undertaking during the year ended March 31st last states that 734 new consumers were connected, this being the largest number connected during any year since the supply was commenced. Sales of electricity rose from 17,737,952 to 19,071,412 kWh. These increases both in the number of consumers and output for domestic purposes are stated to be largely attributable to the establishment of the showrooms, which were opened in November, 1929. The total revenue amounted to £98,193, as against £97,982 in the preceding year, while the total expenditure was £58,055, leaving a gross profit of £40,138. The average price obtained per kWh was 1.222d. After deducting all loan charges, &c., there was a net surplus of £4,094. The decrease in the surplus on the year's working is accounted for by reductions representing approximately £14,000, which have been made in the charges to consumers during the past two years. The total capital expenditure at March 31st last was £575,422.

PURCHASE OF CONISTON UNDERTAKING.—The Town Council has decided to make an offer to the Coniston & District Electricity Supply Co., Ltd., for the acquisition of its undertaking In the event of the offer being accepted application is to be made for sanction to a loan of £8,700, of which £3,500 will be for the purchase of the undertaking, and £5,200 for expenditure necessary to ensure an adequate supply to existing consumers and to extend the undertaking.

EXTENSIONS.—The Town Council has approved a scheme for the supply of electricity to Beekside (Cartmel), Newby Bridge, Haverthwaite and Lakeside, at an estimated cost of £6,050.

Berwick-on-Tweed. — ELECTRICITY SCHEME. — The Town Council has been informed by the Electricity Commission that unless financial assistance from the Exchequer is forthcoming, the construction of secondary transmission lines between Galashiels and Berwick will be delayed for some years. An endeavour is, however, being made to obtain the necessary financial aid in order to accelerate the scheme.

Blackburn.—LOAN.—The Town Council is applying for sanction to the borrowing of £25,000 for future expenditure on electricity mains and services.

Bolton.—ADDITIONAL BOILER PLANT.—The Corporation Electricity Committee has authorised the electrical engineer to install two additional steam-raising units at the Back-o'-the-Bank generating station.

Bournemouth.—FUTURE OF ELECTRICITY UNDERTAKING.—A joint committee representing the local authorities at Bournemouth, Poole and Christchurch, which has been considering the purchase of the local undertaking, recommends the extension of the supply company's tenure for a period of 21 years, with an option clause to take over at the end of ten years from 1932.

Bradford.—FLOODLIGHTING DURING PAGEANT.—The Corporation Electricity Committee has agreed to provide at its own expense floodlighting for the chief buildings of the city, including the Town Hall and the Cathedral, during the Pageant which is to be held from July 13th to 18th. A certain amount of difficulty is anticipated owing to the smoke-blackened condition of practically all the buildings.

MAINS EXTENSIONS.—The Corporation Electricity Committee has voted £20,000 for mains extensions, &c.

Bristol.—LOAN FOR METERS.—The Corporation Electricity Committee is to apply for sanction to a loan of £50,000 for the provision of meters.

ELECTRIC COOKING AT SANATORIUM.—The Corporation Health Committee recommends the provision of a central kitchen at Ham Green Sanatorium equipped for cooking by electricity at a cost of about £5,800.

Burnley.—LOAN SANCTIONED.—The Corporation has received sanction to the borrowing of £30,000 for projected expenditure on mains and services during the ensuing year.

Canada.—HYDRO-ELECTRIC DEVELOPMENT IN QUEBEC.—A statement issued by the Quebec Department of Lands and Forests shows that capital to the amount of $600,000,000 is invested in hydro-electric developments throughout the province, producing 13,000,000 h.p. The greater part of the power is used in the pulp and paper industry. The total investment throughout the whole of Canada is $1,400,000,000.

Cockfield (Durham).—ELECTRICITY SUPPLY.—The Parish Council has decided to install electricity at Cockfield, Burnt Houses, Esperley Lane, and Fell Houses at a cost of £5,000.

Colchester. — EXTENSIONS.—The Corporation Electricity Committee has decided to provide l.p. distribution in Bradfield (£1,700), Tiptree (£5,212), and East Bergholt (£3,464). The engineer has also been asked to consider the advisability of preparing schemes for l.p. distribution in other districts for submission to the Unemployment Grants Committee.

NEW ELECTRICITY OFFICES.—Sanction has been obtained to a loan of £6,190 for the provision of new electricity offices.

Continental.—BELGIUM.—In order to meet the ever-increasing demand for power supply, the Société des Centrales Electriques des Flandres et du Brabant has during the past three years rapidly increased the capacity of its three power stations until the total capacity is now 159,500 kW as against only 59,000 kW in 1928. The three plants are Langerbrugge (118,000 kW), Oisquercq (30,000 kW), and Zeebrugge (11,500 kW). The company is taking a very active part in the development of electro-chemical industries in Belgium.

CZECHO-SLOVAKIA.—The Minister of Labour in Czecho-Slovakia has prepared a draft scheme for the conversion of private electricity works into public utility companies. The transformation is proposed to take place in three stages.

SWITZERLAND.—According to a recent report, hydro-electric power stations in Switzerland have an aggregate capacity of nearly two million h.p. capable of an annual output of 6,000,000,000 kWh. When the stations at present in course of construction are completed, the total generating and output capacity will amount to 2,300,000 h.p. and 7,150,000,000 kWh. respectively. Further extensions are planned and additional concessions to the extent of 1,640,000 h.p. have been granted.

POLAND.—That the world industrial depression has extended to Poland is indicated by the fact that during last year the sales of the Société de la Centrale Electrique du Bassin de Dombrowa amounted to 36,831,513 kWh as compared with 37,496,106 kWh in 1929. The company has recently inaugurated a campaign with the object of encouraging the use of electricity for domestic purposes and in this connection has introduced a special night tariff for water-heating appliances. This campaign is being attended with good results and already 4,280 consumers have had appliances installed.

Doncaster.—HIRE-PURCHASE APPARATUS.—The Corporation Electricity Committee has allocated £4,000 out of its profits to the buying of hire-purchase apparatus.

Edmonton.—NEW SHOWROOMS.—The North Metropolitan Electric Power Supply Co. has purchased a site in Fore Street for the erection of showrooms.

Exeter.—YEAR'S WORKING.—We have received from Mr. A. L. Keet, borough electrical engineer, a statement of the accounts of the Corporation electricity undertaking for the year ended March 31st last. The total revenue amounted to £93,427 and the working expenditure was £45,601, leaving a gross profit of £47,826. The corresponding figures for the preceding year were: Income £84,442; working expenses £42,458; gross profit £41,984. To the gross profit was added balance carried forward from the previous account (£9,155) and unemployment grants (£1,735), making a total of £58,876 available. After providing for loan repayments and interest (£28,045), income tax (£3,651), change-over expenses (£3,391), revenue contributions to capital (£5,966), reserve and renewals fund (£9,156) and sundry other charges, there remained a net surplus of £7,913, which compares with £9,158 in 1929-30. During the year £78,926 was spent on capital account, making a total expenditure of £530,124.

Folkestone.—PROPOSED PURCHASE OF UNDERTAKING.—The Town Council has decided to engage financial and electrical engineering experts in connection with the proposed purchase of the undertaking of the Folkestone Electricity Supply Co., Ltd.

Guildford.—NEW MAINS.—The Town Council has decided to extend mains to Mount Farm estate, and to re-lay mains in connection with the change-over from d.c. to a.c. at an estimated cost of £2,250.

Haslingden.—ASSISTED WIRING.—The Electricity Committee has received a letter from the Haslingden Electrical Contractors' Association, suggesting that the assisted wiring scheme should be again put into operation. It has been decided that the scheme be re-instituted with certain alterations and that not more than 120 applications be granted in any financial year.

Irish Free State.—THE SHANNON SCHEME.—In Dail Eireann last week, replying to Mr. B. Maguire, deputy for Sligo-Leitrim, Mr. J. N. Dolan, Parliamentary Secretary to the Minister of Industry and Commerce, said that no decision had yet been arrived at to undertake a further development of the Shannon Scheme, or to lower permanently the levels in the upper part of the Shannon. If an unusually dry period should occur this summer it might be necessary, because of the increasing demand for electricity, to lower those levels temporarily, and thus

restrict navigation on the river for a few weeks. Provision would, however, be made for water supplies and sewerage services.

Irlam and Cadishead.—RURAL ELECTRIFICATION.—The Urban District Council has received an application from the local branch of the National Farmers' Union for electricity to be supplied to farms at Irlam and Cadishead Moss. It has been decided to request the Stretford and District Electricity Board to allow its canvasser to visit the farms to ascertain the probable requirements.

Lanarkshire.—GENERATING PLANT FOR SANATORIUM.—The County Council has approved a recommendation of the Public Health Committee to install a new generating set at Hairmyres Sanatorium.

Leeds.—PUMPING PLANT.—The Corporation Waterworks Committee has decided to obtain tenders for the installation of electrically-controlled booster pumps for maintaining the pressure of water in service mains on the Westfield estate.

Lincoln.—YEAR'S WORKING.—The municipal electricity undertaking made a net profit on last year's working of £7,589, as compared with £155 in the previous year. The improved results are accounted for by an increase of £1,022 in revenue and a reduction of £6,412 in expenditure.

Liverpool. — MAINS EXTENSIONS.—The city electrical engineer, Mr. P. J. Robinson, has been authorised to extend overhead and underground h.p. and l.p. mains in the Cronton, Tarbock and Tarbock Green areas, at an estimated cost of £5,100.

ELECTRICAL DEMONSTRATION AT AGRICULTURAL SHOW.—The city electrical engineer has been authorised to arrange with the British Electrical Development Association for a joint demonstration of electrical apparatus at the Royal Lancashire Agricultural Show, which is to be held at Liverpool at the beginning of August.

Manchester.—PROGRESS DURING APRIL.—During the month of April the Corporation electricity undertaking showed an increase of 1,927 kW in connections, bringing the total up to 445,199 kW. Applications received for supplies, including additional supplies, amounted to 1,325, representing a total of 3,097 kW. The number of hired cookers increased by 141, making a total of 7,627 now on circuit. Applications for the hire of cookers numbered 154. A new sub-station was put into commission on the premises of Messrs. Hardman & Holden, Ltd., and new plant was installed in three existing sub-stations. The change-over from d.c. to a.c. had been completed in the cases of 14,681 up to April 30th, while work was in progress involving 2,094 consumers.

Mansfield.—EXTENSIONS.—The Town Council has decided to extend its supply of electricity to Pleasley.

Northfleet.—SUPPLY TO HOUSING ESTATE.—The Urban District Council Housing Committee recommends the acceptance of the offer of the Gravesend Corporation to provide the necessary mains on the Wombwell Park estate free of charge.

Plymouth.—LIGHTING SCHEMES.—The Corporation Parks Committee has decided to accept the estimate of the Electricity Department for the lighting of the roads in the new central park at a cost of £410. It has also been decided to install floodlighting at the battlements of the Citadel at a cost of £250.

SUPPLY TO AERODROME.—The Corporation has asked the electrical engineer to submit estimates for the provision of electricity for lighting and power at the civic aerodrome.

Portsmouth.—GENERATING STATION EXTENSIONS.—The Corporation Electricity Committee is to apply for sanction to the extension of the generating station by the installation of a 20,000-kW generating set.

Price Reductions.—Reductions in the charges for electricity have been made or recommended in the following districts:—

BRIGHOUSE.—Lighting, through ordinary meters: a reduction of ¼d. per kWh with the usual 5 per cent. discount. Lighting through prepayment meters: a new discount of 10 per cent.

TONBRIDGE.—Lighting from 5d. to 4½d. per kWh.

MORLEY.—Lighting from 4d. to 3d. per kWh. All meter rent charges are to be abolished. Any consumer using 50,000 kWh or upwards per quarter for power purposes is to be charged at a reduced rate for lighting purposes for the same premises, *viz.*, 2d. per kWh net, provided that an agreement is entered into that the supply will be continued for a period of not less than five years.

DEWSBURY.—Lighting: For each summer half year or winter quarter, first 500 kWh 4d. per kWh, next 500 kWh 3½d., next 2,333 kWh 3¼d., next 1,667 kWh 3d., and above 5,000 kWh 2½d.

Rochdale.—YEAR'S WORKING.—In spite of bad trade, the Corporation electricity undertaking made a profit of £2,402 on the past year's working. This is about £1,000 less than in the previous year. It has been decided to cease generation of electricity at the Dane Street station during the summer months. Electricity sold during the year totalled 77,718,563 kWh, a decrease of roughly 12 per cent. on the previous year's record sale of 89,763,528 kWh. The decrease is entirely on the industrial side, the domestic sales having risen by over 11 per cent.

Retford.—ELECTRICAL DEVELOPMENT.—The Town Council has received sanction to a loan of £14,278 for expenditure during the next three years on the development of the electricity undertaking. A scheme for the electrification of the northern area of the borough, the cost of which is not to exceed £7,120, is under consideration.

Ripon.—EXTENSIONS.—The City Council is applying for sanction to the borrowing of £10,000 to meet the cost of extending the electricity undertaking.

Rotherham.—ESTABLISHMENT OF DEVELOPMENT COMMITTEE.—The Corporation proposes to allocate £900 from the electricity funds for the purpose of establishing a development committee.

Southport.—LOAN.—The Corporation Electricity Committee has decided to apply for sanction to a loan of £6,000 for new sub-stations, switchgear, and transforming plant.

South Shields.—SWITCHGEAR.—The Corporation Electricity Committee has obtained sanction to the borrowing of £7,406 for the provision of switchgear.

Warwickshire.—SPECIAL ORDER.—The Leicestershire and Warwickshire Electric Power Co. has applied to the Electricity Commissioners for a Special Order authorising it to supply electricity in Burton Dassett, Chadshunt, Chapel Ascote, Fenny Compton, Gaydon, Hodnell, Lower Radbourne, Lower Shuckburgh, Napton-on-the-Hill, Priors Hardwick, Priors Marston, Stoneton, Upper Radbourn, Upper Shuckburgh, Watergall, Wills Pastures and Wormleighton.

Wigan.—YEAR'S WORKING.—The Corporation electricity undertaking showed a net profit of £16,960 for the past year.

Wimbledon.—LOANS SANCTIONED.—The Corporation Electricity Committee has received sanction to the borrowing of £670 for buildings, and £6,494 for plant and kiosks.

Traction

Continental.—SWITZERLAND.—What is claimed to be the most powerful electric locomotive in the world will shortly be put into operation by the Federal Railway authorities. The new engine, which weighs 240 tons, is of 7,500 h.p., and, owing to its great length of 106 ft., the underframe of the locomotive has been constructed in two sections, each running on four driving and three trailing axles. The mechanical and engineering part of the engine has been built by the Winterthur Locomotive Works Co., while the motors and electrical equipment are by the Oerlikon Co. It has been designed to haul express trains weighing 600 tons at a speed of nearly 40 m.p.h. and goods trains weighing 750 tons at over 30 m.p.h. over the St. Gothard line, on which there are gradients of over 1 in 4.

GERMANY.—The Siemens-Schuckert Works Co., of Berlin, has recently completed a number of special electric cars for use on the new express electric railway between Cologne and Bonn. The vehicles are fitted with four 115-kW motors, and operate on the 1,350-V d.c. system. A speed of 62½ m.p.h. can be attained.

Japan.—RAILLESS CARS IN TOKYO.—The Tokyo Municipal Electrical Bureau has decided to proceed with its scheme for the operation of a railless-car service in Tokyo. Six cars will be employed initially and if the results are satisfactory this number will be increased. The Susuki route is to be equipped first and a service is expected to be put into operation in the course of the current fiscal year.

ELECTRIC RAILWAY EXTENSIONS.—The Jobu Electric Railway has applied for sanction to start work on the extension of its electric railway system for a distance of 16 km between Musashi-Kuki and Mukosakai. It is expected that the work will be completed by June, 1932. The extension of the Nunobiki Electric Railway in Nagano Prefecture for a distance of five miles is also to be carried out shortly, at a cost of over a million yen.

Kearsley.—TRAMWAY ABANDONMENT.—The town's tramway system, operated by the Lancashire United Transport and Power Co., was abandoned last Sunday. A 'bus service has been substituted.

Middlesex.—TRAMWAY EXTENSIONS.—The Highways Committee of the County Council recommends that application be made to the Minister of Transport for an Order authorising the construction of a light railway along Mayes Road, Wood Green, and between the existing termini in Alexandra Palace grounds, in order that a continuous service for double-deck cars may be instituted between Wood Green and Hornsey, at a cost not exceeding £20,700.

Northampton.—FARE BOXES ON TRAMCARS.—Boxes are being provided on the Corporation tramcars to enable passengers to pay their fares when conductors are unable to collect them during rush hours.

Siam.—DIESEL-ELECTRIC LOCOMOTIVES.—The Oerlikon Co., Switzerland, has an order in hand for the electrical equipment of 19 Diesel-electric locomotives for the Siamese State Railways, one of 1,400 h.p., six of 900 h.p., six of 450 h.p., and six of 150 h.p. The engines and mechanical equipment for the 450-h.p. machines are being built by Sulzer Gebrüder, of Winterthur, while that for all the other locomotives is being constructed in Denmark by the Frichs Locomotive and Engineering Works, of Aarhus. The 1,400-h.p. machine is to consist of two close-coupled halves, each equipped with a 700-h.p. Diesel engine with corresponding generator and auxiliary dynamo directly coupled to it. The normal speed is to be 600 r.p.m., with steps of 500 and 350 r.p.m. The eight driving axles will each be driven by a self-ventilated traction motor with single reduction gear for a driving wheel diameter of 3 ft. 5.3 in. The one-hour rating of each motor is 122 h.p. at

13 m.p.h., the maximum speed being 28 m.p.h. The eight driving motors are to be controlled in the usual way by regulating the generator pressure, by altering the excitation of the generator by the master controller. The motors are to be connected in parallel in groups of four, fed by one generator. The Diesel engines are to be adjusted for the three different speeds by means of electro-pneumatic control valves actuated by the master controller. The engines will be started by using the generators as starting motors, driven by an auxiliary battery. The plant will be stopped by means of an electro-pneumatic valve which will interrupt the fuel supply. As the locomotive is to operate in a tropical climate, the fans for the coolers of the Diesel engines are to be amply dimensioned to dissipate about 2,575 b.th.u. per h.p.-hour. A separate radiator, cooled by means of two fans, is being provided for each Diesel set, the fans being driven by 20-h.p. vertical self-excited motors fed directly from the exciter. The auxiliaries further include two vacuum pump sets for the brakes, a small compressor for the air operation of the control gear and of the whistle, and two cooling water pump sets, which will come into operation automatically when starting the main Diesel engines. The overall length of the locomotive is 61 ft. 7 in.

South Yorkshire.—TRANSPORT UNDERTAKINGS POOL RECEIPTS.—According to the *Electric Railway, 'Bus and Tram Journal*, the Dearne District Light Railway and the Yorkshire Traction Motor 'Bus Co. have come to an agreement to pool their receipts for a period of 34 years. The decision was reached at the adjourned meeting at Wombwell of the representatives of the two undertakings, one of which, the Dearne District Light Railway, is owned by the Wath, Wombwell, Bolton and Thurnscoe Urban District Councils.

Tynemouth.—TRAMWAY ABANDONMENT.—The Northern Area Traffic Commissioners have granted the application by the Tynemouth and District Electric Traction Co., Ltd., for permission to discontinue its tramway service on the route between North Shields and Whitley Bay and to substitute a 'bus service.

Wigan.—RAILLESS-CAR ABANDONMENT.—The Town Council has decided to abandon the Springfield railless-car system and substitute motor-omnibuses.

Telegraph and Telephone

Australia.—TELEPHONY.—During 1930 the Commonwealth telegraph department reduced expenditure by £67,465, but the revenue decreased by £77,519. Telephones earned £6,033,033; expenditure £6,160,067. The ratio of telegrams to population was higher than that of any country of the world, excepting New Zealand, but the telephone service did not progress during the year at the same rapid rate as in former years. According to the *Electrical Trader* (Sydney) 11,567 lines and 14,890 telephones were added, which brought the total in use to 520,160, which average 8.08 per 100 persons.

China.—LONG-DISTANCE TELEPHONY.—It is expected that the Canton-Hongkong line will be completed in July, and that communication will be open to the public in August. The tolls will be payable at each end in local currency, $2.60 for three minutes' conversation from Canton, and $2 for a similar period for calls originating in Hongkong. The China Electric Co., contracted to construct the line for $455,000 gold ($1,638,000 Canton currency), says the *Chinese Economic Bulletin*, payable from the annual profits on the working of the line. For the first year it is estimated that calls will average 600 per day, increasing in the second year to 1,000 and in the third year to 1,600 calls daily. Annual expenses are estimated at $281,094 (Canton currency) per annum, including $131,040 to be paid to the contractors as interest.

Italy.—TELEPHONY IN SARDINIA.—The Italian Ministry of Communications has recently decided on the laying of a new submarine cable between the Island of Sardinia and the mainland. The cable will be a compound one, providing means for telephony and for limited high-speed telegraphy.

Lifeboats' Wireless.—NEED FOR BETTER COMMUNICATION.—The development of wireless telephone communication on the British coast will, it is anticipated, result from the Board of Trade inquiry into a yachting accident last year. The report of the inquiry will possibly recommend the linking-up of all parts of the coast by wireless telephone, closer co-operation between lifeboat and rocket stations, and the patrolling of the coast by fast lifeboat cruisers equipped with wireless telephones during stormy weather. The disaster to the Rye lifeboat was directly due to the fact that it took 38 minutes for an important message to reach Rye from Ramsgate. The importance of communication between lifeboats and shore has been realised by the Royal National Lifeboat Institution, and the lifeboats at Stornoway, Stromness, New Brighton, and Dover are already equipped with wireless apparatus.

South Africa.—WIRELESS TELEPHONE SERVICE.—A wireless telephone service between South Africa and England will shortly be opened, according to an announcement made by the Minister of Posts in the House of Assembly. He said that the Government could not at present take the risk of spending large sums of money on the erection of wireless stations in view of recent inventions and constant changes; it proposed eventually to erect its own station. The Government had no intention of departing from its policy of keeping wireless as a State monopoly, but the Imperial Communications Company had approached the Government and asked for permission to experiment with a limited service between Cape Town and England. The Government proposed to allow the company to conduct a limited service without interfering with the Government's right to start its own service at any time, or to call upon the company to desist.—*Reuter* (Cape Town).

The Telephone Service.—PROGRESS.—The total number of telephones operating in Great Britain at the end of the last financial year (March 31st) was 1,982,171, a net increase for the year of 100,061, or 5.3 per cent. On that date one-fourth of the subscribers in Great Britain were served by the automatic system. Of the total, London had 712,493, an increase of 36,710, or 5.4 per cent., over the previous year's total. The smallest proportionate increase occurred in Scotland, whose system, embracing 173,416 telephone stations, increased by only 7,232, or 4.4 per cent. Northern Ireland, with an addition of 1,638, or 7 per cent., claimed the largest percentage increase in the British Isles. The total number of call offices was 34,618, of which 6,872 were in the London area and 27,746 in the provinces. The net addition during the year was 3,527, an 11 per cent. increase over the total for the previous year. The number of effective calls originated during the year 1930-31 is estimated by the Post Office at 1,371,000,000, or 49,000,000 more than the corresponding total for last year.

RAILWAY CALL OFFICES.—The growing popularity of the telephone as a time saver is demonstrated by the fact that the L.N.E.R., in co-operation with the General Post Office, has recently installed 900 telephones at stations all over its system, including those on lines jointly operated with other companies. Over 500 of them have been provided at stations in rural areas and 142 stations serving East Anglian agricultural areas have now been equipped with telephone facilities.

Radio

Belgium.—RELAY REGULATIONS.—Schemes for relaying broadcasting programmes by private undertakings are to be controlled by regulations recently drawn up by the Government. Written authority must first be secured, which will only be issued to persons, or groups of persons, of Belgian nationality able to provide the necessary guarantees, and extends only to the daily complete retransmission of the programmes broadcast from the stations of the Institut National Belge de Radio-Diffusion (I.N.R.). Relay distribution must allow simultaneously and constantly a free choice to each subscriber of at least two French and Flemish programmes. In the area of the country where German is spoken each subscriber must have the choice of two programmes, one being that of the I.N.R. distributed in German. Distributors and subscribers are forbidden to connect to the system any apparatus capable of transmitting signals or messages. The terminal device must include a sound-volume regulator capable of adjustment by the subscriber, who is free to use a loud-speaker of his own selection. Hotels, boarding houses, and similar establishments that may be connected to an installation of this kind must pay for the provision of headphones or loud-speakers by a single payment and payment must also be made for each apartment connected. Hospitals, clinics, sanatoriums, and other places of public service may be authorised to pay only a single tax.

France.—WAVE-LENGTH CHANGE.—The Radio-Normandie station, which has hitherto been transmitting on a wavelength of 223 meters, is now using the wavelength of 219.9 metres (1,364 k/c).

North Regional Station.—ALTERNATIVE PROGRAMME TESTS.—The B.B.C. announces that the national transmitter at the north regional station near Huddersfield is to carry out public reception tests, from June 8th, under normal service conditions on a wavelength of 301.5 metres (995 kc/s). The regional transmitter will also be radiating during the tests, so that listeners in the north can ascertain whether their receiving equipment will provide satisfactory reception of the forthcoming alternative programme service.

Short-wave Propagation.—AMERICAN TESTS.—Investigation of the effects of rain and fog on the propagation of very short radio waves carried out at the Massachusetts Institute of Technology, Cambridge, U.S.A., indicate that the scattering of waves of length greater than about 5 cm is absolutely negligible, beyond which point it increases very rapidly. Water absorbs strongly in the region about $\lambda=2$ cm; absorption bands have been found for considerably lower frequencies, but the magnitude of the corresponding absorption coefficients is small. The general conclusions to be drawn are that rain and fog have no effect on the propagation of radio waves of the frequencies now employed. Rain first begins to markedly influence the propagation of waves less than 5 cm in length. Thereafter the absorption increases very rapidly with decreasing wavelength due both to scattering and the selective absorption of the water molecule. Infra-red radiation should not, therefore, prove satisfactory for communication purposes through heavy fog. The absorption coefficient for this case has not been calculated, but may be readily obtained from formulæ. Although the wavelengths in the infra-red region are very much shorter than those considered here, the condition that $a^4 << 1$ is not violated, since the radius of a rain drop is about 100 times that of a fog particle. For fog the formulæ given in this paper are valid for wavelengths exceeding about 0.05 mm. provided the complex form of the index of refraction is used.

Contract Information

When "Contracts Open" are advertised in our "Official Notice" pages the date of the "Electrical Review" containing the advertisement is given in parentheses below

Contracts Open

Barnoldswick.—June 27th. Urban District Council. Cable extensions. (See this issue.)

Blairgowrie and Rattray (PERTHSHIRE).—June 15th. Town Council. Conversion of public lighting from gas to electricity. Specifications (deposit £1 1s.) from Mr. J. E. MacEwan, 62, Robertson Street, Glasgow.

East Ham.—June 22nd. Education Committee. Installation of electric lighting at Cornwell, High Street and Plashet Schools. (June 5th.)

Egypt.—CAIRO.—July 21st. Ministry of the Interior. Diesel-driven alternator, with accessories, for Mehalla El Kebir power station. (A.X. 10934.)*

August 1st. Ministry of Public Works. Pumping and filtering plant for Edfu power station. (G.X. 10450.)*

Epsom.—June 20th. Electricity Department. Miscellaneous stores, including d.c. meters. Forms of tender from the resident electrical engineer, Electricity Works, Epsom.

Burntisland (FIFE).—June 27th. County Council. Electric lighting installation in 20 houses. Particulars from Mr. Wm. Williamson, architect, Kirkcaldy (deposit £1 1s.).

Denmark.—COPENHAGEN.—July 1st. Lighting Department. Transformers for H.C. Oersted power station. (A. 10944.)*

Exeter.—June 15th. City Council. Installation of electric lighting in 350 houses to be built in Burnthouse Lane. Particulars from Mr. John Bennett, city architect.

Halifax.—June 20th. Housing Committee. Electrical work at Out Station House, Northowram. Particulars from Mr. A. C. Tipple, borough engineer, Crossley Street, Halifax (deposit £1 1s.).

Kirkburton (NEAR HUDDERSFIELD).—June 18th. West Riding Mental Hospitals Board. Wiring for electric lighting in cottages at Storthes Hall Mental Institution. Particulars from Mr. W. E. H. Burton, architect and engineer to the Board, Wakefield.

Lichfield.—July 1st. Staffs. Education Committee. Electric lighting installation at Lichfield Grammar School and headmaster's house, &c. Specifications (deposit £4 4s.) from Messrs. Moffet, Rosher & Mann, consulting engineers, Union Chambers, Temple Row, Birmingham.

Liverpool.—June 25th. Electricity Supply Department. H.p. and l.p. switchgear for static sub-stations. (See this issue.)

London.—CENTRAL ELECTRICITY BOARD.—June 22nd. Site works, foundation works, buildings and cable bridge at Stockport and Bolton for the North-West England and North Wales Electricity Scheme. (May 22nd.)

June 29th. 33,000-V transformers for the North-West England and North Wales Electricity Scheme. (June 5th.)

LONDON COUNTY COUNCIL.—June 15th. Wiring and fittings in two ward blocks at the Eastern Hospital, Homerton Grove, E.9. (May 29th.)

June 17th. Cables in connection with the installation of new ventilating plant at Rotherhithe Tunnel. (May 29th.)

June 22nd. Static transformers with e.h.p. and l.p. switchgear for Greenwich power station. (May 29th.)

WANDSWORTH.—June 19th. Borough Council. Furniture and equipment, including hospital equipment and electric table lamps, for the Borough Maternity Home, Grove Road, Balham. (June 5th.)

OFFICE OF WORKS.—June 22nd. Fuse boards and switches (See this issue.)

Lurgan (NORTHERN IRELAND).—June 18th. Board of Guardians. Electric lighting of the Union Fever Hospital. Specifications (deposit £1 1s.) from Mr. J. Calvert, Clerk's Office, Workhouse, Lurgan.

Manchester.—June 29th. Electricity Department. Transformers, supervisory control equipment and sub-station switchgear. (See this issue.)

Milford Haven.—July 2nd. Electricity Department. Generating plant. (See this issue.)

New Zealand.—WELLINGTON.—August 27th. Government Railways. Underground telephone cable equipment between Wellington and Paekakariki. (A.X. 10932.)*

Siam.—BANGKOK.—July 31st. Post and Telegraph Department. Armoured underground telephone cables. (A. 10928 and A.X. 10955.)*

South Africa.—JOHANNESBURG.—Railways and Harbours. July 27th. Lighting units for the new Concourse Railway Station. (G. 10452.)*

July 16th. City Council. Recording voltmeters. (A.X. 10952.)*

PORT ELIZABETH.—City Council. June 25th. Materials and construction work in connection with the circulating water scheme for power stations. (G.X. 10460.)*

July 23rd. Automatically-controlled centrifugal pumps, &c., for Baakens Valley main sewerage scheme. (G.X. 10461.)*

Sheffield.—June 18th. West Riding Mental Hospitals Board. Installation of electric lighting in female block at Wadsley Mental Hospital. Particulars (deposit £1) from Mr. W. E. H. Burton, architect and engineer to the Board, Wakefield.

Staffordshire.—July 1st. Education Committee. Electric lighting and power installations at several school buildings. (See this issue.)

Withernsea.—June 16th. Urban District Council. Cables, lamp standards, lanterns, &c., in connection with the lighting of promenades. Specifications and form of tender from the U.D.C. surveyor, Municipal Buildings, Withernsea.

* Further particulars can be obtained at the Department of Overseas Trade (Inquiry Room), 35, Old Queen Street, S.W.1.

Contracts Closed

Ampthill.—Rural District Council. Accepted:—
Electric wiring of 68 houses.—C. Brown.

Barrow.—Electricity Committee. Accepted:—
Cookers for the period ending March 31st, 1932.—British Electric Transformer Co., Ltd.; Credenda Conduits Co., Ltd. The electrical engineer has been authorised to purchase from time to time sample cookers of other makers and report to the sub-committee as to their efficiency prior to tenders being invited for the supply of cookers next year.

Birkenhead.—Electricity Committee. Accepted:—
11,000-V cable (£1,570).—Hackbridge Cable Co., Ltd.
Public Assistance Committee. Accepted:—
Emergency lighting equipment at operating theatre.—Chloride Electrical Storage Co., Ltd.

Bristol.—Health Committee. Recommended:—
Electric cooking equipment in kitchen at Ham sanatorium (£2,060).—Falkirk Iron Co., Ltd.

Carlisle.—Electricity Committee. Accepted:—
Two additional switchgear equipments (£2,566), additional protective gear to complete earthing arrangements for 33,000-V system (£264), lamps for 12 months for street lighting.—British Thomson-Houston Co., Ltd.

Dumfries.—Town Council. Accepted:—
Transformer (£90) and h.p. switchgear (£122).—Crompton Parkinson, Ltd.
Cables.—Johnson & Phillips, Ltd.
A.c. prepayment meters.—Ferranti, Ltd.

Essex.—Public Assistance Committee. Accepted:—
Installation of electric light at Tendring Institution (£624).—Dean & Gosling.
Electric bell installation at the Romford institution.—F. R. Skeels.

Great Western Railway. Accepted:—
Twenty electric motors for wagon works, Cathays, Cardiff.—Crompton Parkinson, Ltd.
Two electric lifting magnets for concentration yard, Swindon.—Rapid Magnetting Machine Co., Ltd.

Headington.—Rural District Council. Accepted:—
Installation of electric lighting at 20 houses at Littlemore and Marston.—Lowe & Oliver.

Leeds.—Transport Committee. Accepted:—
Two 500-kW rotary convertors and equipment for Headingley sub-station (£3,658).—Crompton Parkinson, Ltd.
Electricity Committee. Accepted:—
Cables.—W. T. Henley's Telegraph Works Co., Ltd. (£585); Enfield Cable Works, Ltd. (£420); Hackbridge Cable Co., Ltd. (£365); Derby Cables, Ltd. (£1,042); Croydon Cable Works, Ltd. (£494).

Liverpool.—Clarence Dock Power Station Committee. Accepted:—
Condensate pipes connecting the lift and feed pumps with the turbo-alternator sets at the power station (£1,132).—Stewarts & Lloyds, Ltd.
Turbo-type air compressor for soot blowing (£4,417).—Daniel Adamson & Co., Ltd.
Electric Power and Lighting Committee. Recommended:—
Switchgear for the Lister Drive Power Station (£4,303).—Switchgear & Cowans, Ltd.

London.—BERMONDSEY.—Electricity Committee. Recommended:—
Transformer and induction regulator (£108).—Hewittic Electric Co., Ltd.
Combined fuse and isolator (£92).—A. Reyrolle & Co., Ltd.

Manchester.—Education Committee. Accepted:—
Electrical installation at the Gorton Mount Municipal School.—John Collier & Co., Ltd.

Plymouth.—Electricity Committee. Accepted:—
Vaughan crane (£1,302), and reconditioning generating set at Prince Rock (£934).—Metropolitan-Vickers Electrical Co., Ltd.
Cables (other than those for which contracts have been made) for 12 months.—British Insulated Cables, Ltd.

Portsmouth.—Electricity Committee. Accepted:—
Cable.—Derby Cables, Ltd.; Edison Swan Cables, Ltd.; Enfield Cable Works, Ltd.; General Cable Manfg. Co., Ltd.; Hackbridge Cable Co., Ltd.; Johnson & Phillips, Ltd.; Mersey Cable Works, Ltd.; Pirelli-General Cable Works, Ltd.; Metropolitan Electric Cable & Construction Co., Ltd.

Rotherham.—Electricity Committee. Accepted:—
Cable (£726).—Metropolitan Electric Cable & Construction Co., Ltd.
Three 25-kVA transformers (£106), switch and isolating gear (£104).—Crompton Parkinson, Ltd.

South Shields.—Housing Committee. Recommended:—
Electrical installations at Stanley Terrace housing scheme (£345) and Ridgeway scheme (£251).—Watson-Norie, Ltd.

Tilbury.—Urban District Council. Accepted:—
Wiring of 53 Council houses (£448).—H. G. Simmonds.

Forthcoming Events

Association of Mining Electrical Engineers.—June 9th-13th. Annual Convention. Friday, June 12th. Royal Hotel, Cardiff. 6 p.m. Annual dinner.

Faraday Society.—Wednesday, June 17th. Royal Institution, London. "Michael Faraday." Dr. R. L. Mond.

Incorporated Municipal Electrical Association.—June 15th-20th. Scarborough. Annual Convention.

International Conference on Extra high-pressure Systems.—June 18th-27th. Paris, France.

Royal Society of Arts.—Wednesday, June 24th. Adelphi, W.C. 4 p.m. Annual general meeting.

Electrical Contractors' Association.—June 24th-26th. Eastbourne. Annual Conference.

Municipal Tramways & Transport Association.—June 24th-26th. Southampton Annual Convention.

Our Service Department

Inquiries must be accompanied by a stamped addressed envelope.

We shall be glad to learn the names and addresses of makers of the following:—

"STELLITE" switch-fuses.
"LION" toasters.
"TRINITY" lamps.
"SUNFLEX" electric fire.

Notes

Railway Electrification

Answering questions in the House of Commons on June 2nd, the Minister of Transport said that there were two recognised alternative standard systems of railway electrification in this country, full particulars of which would be found in the report of the Railway Electrification Committee (1927). The two standard systems recommended by the Committee were (*a*) the d.c. overhead, with a maximum pressure of 1,500 V; and (*b*) the d.c. third rail, with a maximum pressure of 750 V. A considerable proportion of the route mileage of electrically-worked railways on the Continent and in America was electrified in accordance with systems which did not differ materially from those proposed for Great Britain, but various other systems were also in use abroad and to some extent in this country.

A Delayed Compensation Claim

THE Second Division of the Court of Session, Edinburgh, recently disposed of an appeal by the employers in a case under the Workmen's Compensation Act, 1925, in which the parties were a workman and the Coltness Iron Co., Ltd., Salsburgh. In September, 1928, an electric cable close to the man's working place in the colliery was accidentally cut, and the rails and other apparatus became charged with electricity. The workman received a severe shock, and a fellow-workman a few yards away was killed. Though the claimant, on the advice of his doctor, continued his ordinary work for six weeks, he was unable to overcome the nervous derangement resulting from the shock. He was partially incapacitated for work between December, 1928, and February, 1929, and he had also been partially incapacitated for work by reason of the shock since October 7th, 1929.

The Sheriff-Substitute at Airdrie had found the workman entitled to compensation. On appeal, the employers were allowed to amend their pleadings, and the case was sent back to the Sheriff-Substitute, who reported that the workman had failed to prove that he made a claim for compensation within the statutory six months, but that there was reasonable cause for his failure to do so.

The Court of Session confirmed this decision and ruled that the claimant was entitled to compensation and expenses.

Oil from Coal

Sir Richard Redmayne in a letter to *The Times* mentions two outstanding facts relative to the low-temperature treatment of coal, namely:—

(1) The low-temperature distillation of coal has passed from the experimental stage and is now, and has been for some years, extensively and satisfactorily prosecuted at the Dunston Works of the Newcastle Electric Supply Company.

(2) The liquefaction of coal by the hydrogenation process has been abandoned in Germany—after considerable monetary expenditure—both in respect of the treatment of the true (black) coal and the immature or brown coal, and is now only applied to the treatment of tar oils obtained by the distillation of coal.

Given a process which is satisfactory from the engineering point of view, in order that the low-temperature distillation of coal may be carried out on a successful commercial basis two requirements must be fulfilled, namely:—

(1) The coal used must be of a character and quality suited to the process. Most manufacturing and household coals meet this requirement; steam and most coking coals do not.

(2) There must be available a ready market for (*a*) the residual fuel; (*b*) the gas; and (*c*) the other by-products.

It is for the second reason that commercial success is most assured when the process is worked in conjunction with an electric power station, for the residual fuel can be used for the generation of steam and the surplus for sale for domestic use; and the gas, if not consumed in the working of the process, can be satisfactorily used by burning under the boilers. The tar, without refinement, constitutes a satisfactory fuel oil. The point is, can it be supplied at a price which will compete with that of imported fuel oil? If the tar is refined, derivatives are obtainable, such as motor spirit, other oils, wood preservatives, sheep dip, &c., which widen the narrow margin of profit per ton.

In order to secure the availability of a large supply of "low temperature" tar in this country three things are necessary, namely:—

(1) The great electric power stations now being established should be worked in conjunction with low-temperature distillation plants;

(2) the British public should be educated to the advantages of using the semi-coke; and as an inducement to the latter requirement

(3) the price of the semi-coke should not exceed that of a high-grade domestic coal.

Finally a word of warning. Few manufacturing processes have suffered more from exaggerated anticipation than that of low-temperature carbonisation of coal.

Appointments Vacant

Junior mains assistant for Willesden Electricity Department.

Lady demonstrator of electrical cooking and domestic apparatus for Sale Electricity Department.

(See our advertisement pages to-day.)

Changing the Guard at Wishaw

On Monday, June 1st, automatic electric traffic control signals were inaugurated at Wishaw East Cross. These form another link in a chain of automatic control of the town—the first link having been forged some time ago by the erection of police boxes placed at convenient points in the burgh and fitted with automatic call signal lights.

The traffic control signals are of the two-way type which enable a vehicle driver to have two separate indicators—one on the near side of his vehicle and one on the diagonal corner

ahead in case of his view being obstructed by anything such as a double deck 'bus.

Provost Anderson, J.P., closed the switch which set the signals to work and dispensed with the services of the crossing traffic policeman.

The signals are of Holmes-Reyrolle manufacture, and were erected by the Burgh Electricity Department. A second set of signals are in course of manufacture for Motherwell Cross.

In the group shown in the accompanying photograph may be seen, reading from left to right: Mr. W. D. Brassington, A.M.I.E.E. (Burgh Electrical Engineer), Provost Anderson, J.P., M.I.E.E., Bailie McKerrigan, Dean of Guild Chambers, A. G. Stewart (Town Clerk), Bailie Lanery, and Mr. G. Martin (representing the manufacturers).

B.S.S. for Ebonite

The British Engineering Standards Association has recently issued a revision of British standard specification No. 234, Ebonite for Electrical Purposes. This new edition is an extension of the original (1925) specification, which provided only for ebonite panels for radio purposes, and covered only one grade of ebonite. In the new edition, however, the scope has been widened to cover pure non-loaded ebonite in the form of sheets, rods or tubes suitable for electrical purposes, including radio apparatus. Two grades of ebonite are now included, one of these being similar to that covered by the old specification, and the other grade having superior electrical and mechanical properties, this grade being intended for use where the highest quality material is required. The majority of the methods of test are similar to those in the old specification, but in one or two cases the description has been amplified, and recommendations are given for a method of detecting metallic particles in ebonite to be used for high-frequency high-voltage work.

Copies of this specification (No. 234-1931) can be obtained from the British Engineering Standards Association, Publications Department, 28, Victoria Street, London, S.W.1, price 2s. 2d. post free.

London and Home Counties J.E.A.

The chairman of the London and Home Counties J.E.A. (Mr. W. F. Marchant, O.B.E., L.C.C.) is submitting a memorandum to the Conference of Electricity Supply Authorities on the subject of electricity charges and methods of charging.

Mr. Marchant mentions that a committee of the J.E.A. has, from time to time during the past two years, had the subject under review as regards the London and Home Counties area and summarises the conclusions of the committee appointed by the Electricity Commissioners which were published last July (ELECTRICAL REVIEW, August 1st and 8th, 1930). He says that practically every one of the recommendations has been applied by one or other of the supply authorities in the district for some years past and that there is now a marked tendency towards uniformity of methods and basis of charging. Nevertheless, it still remained true of the district as a whole that "a notable feature in the organisation of the supply of electricity is the large number and diverse character of the tariffs and methods of charging which are at present offered for the various classes of supply."

The undertakings are classified in relation to tariffs for (*a*) domestic, (*b*) business and office premises, and (*c*) small industrial power supplies into three groups: (i) applying the forms of multi-part tariff recommended; (ii) applying other forms of multi-part tariffs; (iii) not applying any form of multi-part tariff. Statements are given as to the forms of multi-part tariffs in each case, and the average prices received per kWh for the years 1926-27 to 1929-1930. A return of actual tariffs in existence on January 1st, 1931, was included in the last annual report of the J.E.A. (ELECTRICAL REVIEW, March 6th, 1931).

The recommended primary basis is: (*a*) domestic, size of house; (*b*) business and office premises, kW of m.d.; and (*c*) small power, a kWh charge for an initial number of kWh per kW or h.p. installed.

An analysis of the tariffs for each of the three groups gives the following number of undertakings in each case.

	(*a*) Domestic.	(*b*) Business.	(*c*) Power.
Recommended	18	38	6
Other multi-part	44	12	27
Without fixed charge	22	34	51

"Other multi-part domestic tariffs" included the following basis for the fixed charges: floor area, 1; per room, 2; rateable value, 15; rateable value, floor area, and watts installed, 1; maximum demand (hours of use), 12; maximum demand (kW or kVA of m.d.), 6; watts installed, 28; per lamp installed, 1.

It is suggested that it may be practicable as a first step for many undertakings to adopt the same forms and basis of multi-part tariffs and the same methods of arriving at the primary and secondary charges and also to attain uniformity in meter rents and in hire and hire-purchase terms. The formation of a small committee to collect data and make recommendations from time to time is tentatively proposed.

Large Russian Turbine Works

According to reports from Moscow a new turbine works is being constructed on land adjoining the Kharkoff electro-mechanical works, which is one of the largest works in Russia. The buildings will have a length of 365 metres, a breadth of 88 metres and a height of 35 metres with ten storeys. The output capacity proposed is stated to represent 2,000,000 h.p. hours per annum.

Large Kaplan Turbines

The Rhein-Kraftwerk Albbruck-Dogern Gesellschaft has recently placed contracts with Escher Wyss & Co., of Zurich for the hydraulic equipment for its new hydro-electric power station, embodying three Kaplan vertical-shaft turbines, each for an output of 33,700 h.p. The turbines will have adjustable guide wheels and runner-wheel blades and are being designed for a maximum capacity of 33,700 h.p. under heads of from 26 to 38 ft. They rank among the largest in the world, the external diameter being 39½ ft., and the runner wheel, whose propeller-shaped blades are adjustable by hydraulic pressure, nearly 23 ft. Each unit weighs 500 tons, *i.e.*, it requires 50 normal railway trucks for its transport. The arc shafts of 80 centimetres diameter and the weight of the rotating parts, including the hydraulic pressure acting on the runner wheel, amounts to approximately 900 tons, necessitating a special design of bearings.

Scientific Institutions and Income Tax

A judgment of some importance to engineering and scientific societies was delivered in the Court of Appeal on Monday last. The Institution of Civil Engineers appealed against a decision of Mr. Justice Rowlatt that its income was not exempt from taxation, on the ground that it was not a "charity" within the meaning of the Finance Acts. The Institution's case was that its objects were the advancement of mechanical science and the regulation of matters connected with the engineering profession; that it awarded medals, prizes and scholarships; that it granted the use of its rooms for lectures, &c.; and that it had a benefit fund for its members and their families. The inland revenue authorities maintained that although the main object of the Institution was the advancement of mechanical science, an admittedly charitable purpose, a substantial part of its purposes was to secure the benefit of its members.

In giving judgment, the Master of the Rolls quoted precedents, including a judgment of the House of Lords in a previous action in which the Institution had been described as a society which did "something higher than the mere education of students and others for the profession of civil engineer." He therefore allowed the appeal, and Lords Justices Lawrence and Romer concurred.

The Swan Memorial

Mr. Clifford C. Paterson, president of the I.E.E., speaking last Friday at the unveiling ceremony of the bronze tablet erected at Sunderland in memory of the late Sir Joseph Wilson Swan, remarked that ever since 1880 when Swan handed his first electric lamp to the world, some of the best brains in Europe and America had been concentrating upon the problems of the lamp, but its secrets were not yet fully understood. Colonel J. Lynn Marr, the chairman of the Memorial Committee, said that electrical engineers honoured Sir Joseph as the inventor of the carbon-filament lamp and the cellular lead-plate electric storage battery. The tablet was designed by Mr. R. A. Ray, of the Sunderland Art School.

Educational

An evening class in electrical engineering is being added to the list of subjects dealt with at the Wandsworth Technical Institute. An electrical engineering laboratory has recently been set up at the Institute, equipped with plant and apparatus to enable tests of dynamos and motors to be undertaken and demonstrations given of various electrical appliances and instruments.

Cable Beats a Crowbar

Electric cables are frequently called upon to undergo treatment for which they were never intended, an instance being a Henley 0.1 sq. in. 4-core cable working at 400 volts on a 3-phase system at Abingdon-on-Thames, Berkshire. It appears that the Western Electricity Supply Co., Ltd., recently found it necessary to alter the route of one of its overhead lines. At one of the terminal poles the Henley cable mentioned was found to have sustained severe mechanical strain. Inquiries showed that when the water authorities ran a main at that spot in 1915 one of their workmen bent the cable with a crowbar to make room for the pipe. The result was two sharp right angle bends in the cable, the two coats of steel tape armouring being so forced as to have no overlap. In spite of the mechanical damage, the cable would have continued to give satisfactory service had the alterations not made its removal necessary.

Fatality

David Galloway, Kelty, a linesman employed by the Fife Coal Co., Ltd., received a fatal electric shock on June 3rd while examining an overhead cable near Kirkford Colliery, Cowdenbeath.

Association of Consulting Engineers

The annual general meeting of the Association of Consulting Engineers, Inc., was held in London on May 29th, Mr. A. H. Dykes, chairman, presiding. The annual report shows the membership to be 131, a net addition of nine during the year. As an expression of the appreciation of the work done as honorary secretary by Mr. A. H. Dykes since the inception of the Association, the committee marked the 21st year of its existence by electing him chairman, and appointed Mr. S. R. Raffety as acting honorary secretary.

The most important feature of the year has been the completion of the standard "Form of Agreement and General Conditions of Contract for use in connection with Works of Civil Engineering Construction." The extent to which they have been used has surpassed all expectation, and is clear evidence of the value attached to them by members of the profession, legal advisers to public authorities, and others; nearly 9,000 copies have been sold already.

The Irish Electricity Supply Board

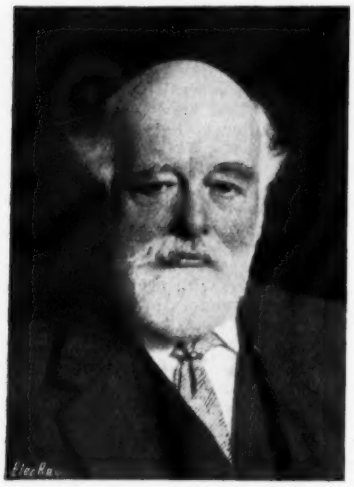
The Irish Free State Electricity Supply Board is carrying out a system of de-centralisation for the purpose of relieving the burden upon its Dublin headquarters. The original scheme provided for eight district headquarters, including Dublin and Ardnacrusha. Most of the engineering work was done from Dublin, the engineers proceeding from Dublin to various parts of the country. The scheme being carried out will reduce the number of country areas and give them more power and the town stations will be increased to include Dublin, Dublin County, Cork City, Cork district, Waterford, Tralee, Limerick, Maryborough, Athlone, Ardnacrusha, Sligo, Galway and Dundalk. Each town or area will have its own technical adviser, installation superintendent, commercial managers, and other staff officials. All reports will be dealt with locally and showrooms for demonstration purposes will be included in each area.

At a recent meeting of the Association of Free State Chambers of Commerce, Mr. Dorgan, Cork, proposed a resolution to the effect that business representatives should be permanently retained in a majority on the Electricity Supply Board, so that that body should be maintained as a commercial board of control in the interests of efficiency. Mr. Kenny suggested an amendment expressing the view that it was desirable that a fair proportion of members other than civil servants should be placed permanently on the Board. This amendment was accepted by Mr. Dorgan and carried.

Our Personal Column

Electrical men are invited to enable us to keep readers of the "Electrical Review" posted concerning their movements

Sir Oliver Lodge, the distinguished scientist, was born on June 12th, 1851. He therefore celebrates his eightieth birthday to-day (Friday) and the congratulations of the whole scientific world will go out to him. The electrical industry will also desire to felicitate him upon his attaining his eightieth birthday and still remaining active among the leaders of modern thought. He can rightly be regarded as an electrical pioneer, for his researches into radio communication, electrical precipitation and other branches reach back many years. Sir Oliver has been a prolific writer, but it is perhaps as a lecturer that he is best known to the public, for he has that rare gift of making some of the most difficult scientific matters intelligible to the unlearned. Honours have been conferred upon him by many universities and scientific societies. Among them has been the honorary membership of the Institution of Electrical Engineers, to which he was elected in 1924; he had been a member of the Institution since 1889.



Elliott & Fry [*London.*

Sir Oliver Lodge, F.R.S.
who is 80 years old to-day.

We trust that Sir Oliver will enjoy many more years of active life.

Mr. E. J. Shuter, who has been with the Illuminating Engineering Department of the General Electric Co., Ltd., since September, 1927, is leaving the company on June 15th, to take up a position with Claude-General Neon Lights, Ltd.

The Northern Ireland Minister of Commerce has appointed the following as the Electricity Supply Board under the Electricity Supply Act (Northern Ireland), 1931: Mr. Malcolm Gordon (chairman), Mr. A. H. Muir, F.C.A., Major R. Stevenson, D.L., and Mr. W. D. Scott, C.B.E.

Mr. K. P. Cooke, Provincial Minister without Portfolio, has been appointed permanent chairman of the Hydro-Electric Power Commission of Ontario in succession to Mr. C. A. Magrath, who recently resigned. The **Rt. Hon. Arthur Meighen,** the former Dominion Prime Minister has also consented to become a member of the Commission, reports *Reuter* (Toronto).

On the occasion of his marriage at Chelmsford to Miss Ivy Turner, **Mr. W. C. Gammier,** manager of the Eastern Electric Installation Co., Ltd., was presented by the staff and employés of the company with a collection of electric household appliances.

Mr. F. N. Rendell-Baker, who recently left Halifax to become borough electrical engineer at Croydon, was presented last week with a grandmother clock by the staff of the Halifax undertaking as a mark of esteem on his leaving the town. Councillor S. Thornton, vice-chairman of the Electricity Committee, presided over the gathering and the presentation was made by Alderman Thos. Hey, chairman of the Electricity Committee.

Mr. W. G. H. Riseley, who was formerly with the General Electric Co., Ltd., and the British Thomson-Houston Co., Ltd., has joined the Revo Electric Co., Ltd., as representative in the south-west district of England.

Mr. W. Diamond, the engineer-in-charge of the Mitcham electricity undertaking which is being transferred as from July 1st from the Electric Supply Corporation, Ltd., to the Mitcham Urban District Council, is to continue as electrical engineer to the Council at a salary of £400 per annum, with free accommodation. The Council has agreed to the continuance of the present arrangement under which Mr. Diamond receives £40 per annum from the North Metropolitan Electric Supply Co. in respect of emergency switching operations at the local sub-station of the company.

Mr. E. A. Marx has been appointed manager of the Leeds branch of Siemens Electric Lamps and Supplies, Ltd.

Mr. R. A. Coke, second mains engineer to the Southport Corporation, has been appointed assistant district mains engineer to the Newcastle-upon-Tyne Electric Supply Co., Ltd.

Mr. E. P. Hort, junior engineer-in-charge at the Hammersmith electricity works, has been promoted to engineer-in-charge. He succeeds **Mr. J. C. Sleigh** who has secured an appointment with the Torquay Electricity Undertaking.

The question of appointing a successor to the late **Mr. C. A. Grut,** electrical engineer and manager, was discussed by the Inverness Town Council last week. In was decided to adopt the Electricity Committee's recommendation that the post be advertised with a commencing salary of £500 per annum, rising to £650 by annual increments of £25.

The Sheffield Finance Committee recently recommended that the salary of **Mr. E. Morgan,** general manager and engineer of the Electric Supply Department, be increased from £1,250 to £1,500 per annum, by two annual increments of £125.

Replying at the last meeting of the Sheffield City Council to criticisms of this recommendation, Alderman Rowlinson pointed out that salaries in the electricity supply industry in various parts of the country had been nearly doubled. "Over 40 per cent. of the electric supply is in the hands of foreigners, and they are paying extraordinary salaries for the best men." [! EDS. E.R.] The recommendation was approved.

Mr. A. L. Keet, city electrical engineer, Exeter, states that his salary has been increased to £950 per annum, not £900 as stated in our last issue. He points out that this is in accordance with the minimum scale for chief electrical engineers agreed between the I.M.E.A. and the A.M.E.E.

The Vienna correspondent of *The Times* reports that **Dr. Egon Seefehlner,** chairman of the governing board of the Allgemeine Elektricitäts Gesellschaft of Germany and Austria, and president of several other electrical companies, has been appointed managing director of the Austrian State Railways.

Mr. P. Harkin, engineer-in-charge in Dublin under the Irish Free State Electricity Supply Board, has been elected president of the Association of University Electrical Engineers, Dublin. **Dr. T. McLaughlin,** who has just resigned from the Electricity Supply Board, and **Mr. P. J. Tierney** have been elected vice-presidents.

In the reference to **Col. Crompton** in our last issue we referred to the company which Col. Crompton established 43 years ago. We should have said 53, as he began electrical work at Chelmsford in 1878.

Mr. Trevor David, A.M.I.E.E., and Miss G. F. Haine, B.A., were married at Neath on May 26th. Mr. David is on the Birmingham staff of Callender's Cable and Construction Co., Ltd.

Obituary

Mr. B. Kay.—We regret to learn of the death, on June 1st, of Mr. Barnes Kay, engineer and manager of the Haslingden Corporation Electricity and Transport Departments. Mr. Kay, who was 62 years of age, became tramway manager at Haslingden when the Corporation took over the local system in 1908. In 1911 the Corporation inaugurated an electricity supply and, in addition to his tramway duties, Mr. Kay became manager of that department. Among other inventions, Mr. Kay devised an apparatus for the instantaneous electrical heating of water, the current being switched on by the turning of the water tap. He was taken ill suddenly at the I.M.E.A. Convention at Eastbourne last year and he never recovered from this, although he persisted in carrying out his duties. At his funeral on June 3rd there were many representatives of the Haslingden Council, municipal departments, and of neighbouring authorities.

Mr. J. Range.—Mr. John Range, who was in charge of the machine shops of the Liverpool Corporation Electric Supply Department, died on May 29th. Mr. Range entered the service of the Liverpool Electric Supply Co. in 1885, and was taken over on the transfer of the undertaking to the Corporation in 1896. He had therefore been connected with the undertaking for close upon 46 years, which is in the nature of a record.

Mr. C. Horne.—The death occurred on May 30th, at the age of 48, of Mr. Charles Horne, who was in business as an electrical engineer at Middlesbrough.

Herr S. Schneider.—The death is reported from Berlin at the age of 52 years of Herr Stephan Schneider, chief engineer of the Siemens Elektrowärme Gesellschaft, and a leading German authority on electric heating appliances.

Mr. C. W. Booty.—The death occurred last week of Mr. Charles W. Booty, who was in charge of the Duke Street station of the Norwich Corporation for some years. He was formerly with Messrs. Laurence, Scott & Co., Ltd.

Wills.—Mr. James McLaren, late of North Sunderland, a director of the Seahouses and District Electric Lighting Co., Ltd., left £9,739 gross (£7,041 net personalty).

The late **Mr. William E. Gray,** joint managing director of the India Rubber, Gutta Percha and Telegraph Works Co., Ltd., left estate valued at £90,471 gross and £86,948 net.

Financial Section

New Companies, Returns of Share Capital, Debenture Charges, Reports of Electrical Companies, Dividend Changes, Transactions in Stocks and Shares

New Companies Registered

Hampton Radio, Ltd.—Private company. Registered May 29th. Capital £600 in 500 10 per cent. non-cumulative preference shares of £1 and 2,000 ordinary shares of 1s. each. Objects: To carry on the business of manufacturers of and dealers in wireless transmitting and receiving sets and installations, scientific instruments and apparatus of all kinds, &c. The directors are: P. F. Grinstead, "Durrington," Beresford Road, Cheam (managing director General Tile Co., Ltd.), and R. J. T. Norton, "Addizel," Hanworth Road, Hampton, Middlesex (radio engineer). Registered office: 1-3, Vicarage Road, Hampton Wick, Middlesex.

V. C. Bond & Sons, Ltd.—Private company. Registered June 8th. Capital, £5,000 in £1 shares. Objects: To acquire the business carried on at The Grove, Mare Street, Hackney, as V. C. Bond & Sons, and to adopt an agreement with V. C. Bond, and to carry on the business of manufacturers of and dealers in wireless transmitting and receiving sets, component parts, accessories and installations, gramophones and electrical apparatus, electrical and mechanical engineers, &c. The subscribers are: H. Creassey, 70, Westbrook Avenue, Margate (solicitor), and B. Stone, 131, Windsor Road, Ilford, law clerk. The first directors are not named. Registered office: 61, The Grove, Mare Street, Hackney, E.8.

L-P-W Plating Plants, Ltd.—Private company. Registered June 6th. Capital, £100 in £1 shares. Objects: To carry on the business of manufacturers, importers and exporters of and dealers in electro-plating plants, electro and other deposition plants, accessories, equipments, chemicals, dynamos, motors, machinery and all other electrical, chemical and electro-chemical articles, &c. The subscribers are: J. Morgan, 112, Mortlake Road, Ilford (solicitor's clerk), and R. F. Darrell, 3, London Wall Buildings, E.C.2 (solicitor's clerk). The first directors are: Wilhelm A. F. Pfanhauser, Walter F. Wuerker, and Geo. Cooper (permanent managing director and secretary). The two first named are to retain office for life. Registered office: 119, Bishopsgate, E.C.

Bell's Heat Appliances, Ltd.—Private company. Registered June 6th. Nominal capital of £60,000 in £1 shares. Objects: To carry on the business of manufacturers of, agents for and dealers in stoves, boilers, cookers, heaters, radiators, refrigerators, and boiling, cooling, drying, filtering, heating, insulating and ventilating machines, contractors, constructors, engineers, electricians, &c. The subscribers are: E. R. Ball (managing clerk), and R. G. Puxley (law student), both of 24, St. Mary Axe, E.C.3. The first directors are to be appointed by the subscribers. The registered office is at 157, Queen Victoria Street, E.C.4.

Returns of Electrical Companies

County of London Electric Supply Co., Ltd.—Particulars filed of £5,000,000 debenture stock (inclusive of £4,500,000 already registered) authorised by resolutions of April 25th, 1927, July 31st, 1930, and May 19th, 1931, and covered by trust deeds dated May 19th, 1927, August 21st, 1930, and May 29th, 1931, the amount of the present issue being £500,000. Property charged: The company's undertaking and property, present and future, including uncalled capital. Trustees: Electric and General Investment Company, Ltd., and Law Debenture Corporation, Ltd.

Frinton-on-Sea and District Electric Light and Power Co., Ltd.—Satisfaction to the extent of £4,000 on January 31st, 1931, of debentures authorised July 1st, 1915, and registered July 19th, 1915.

R. F. Peachey & Sons, Ltd.—Deposit on May 20th of deeds of land in Park Way, Friern Barnet, to secure all moneys due or to become due from the company to Barclays Bank, Ltd.

Stuart Turner, Ltd.—Mortgage on 61, Market Place, Henley-on-Thames, dated May 16th, to secure all moneys due or to become due from the company to the Westminster Bank, Ltd.

Meloto Co., Ltd.—Debenture dated May 27th to secure all sums now or from time to time owing to the Vocalion Gramophone Co., Ltd., of 2, Duncan Avenue, Grays Inn Road, W.C.2, not exceeding £5,000 at any one time. Property charged: The company's undertaking and property, present and future, including uncalled capital.

W. P. Barnell & Co., Ltd.—Capital, £2,500 in £1 shares. Return dated January 23rd, 1931. 2,367 shares taken up. £2,367 paid. Mortgages and charges, nil.

B.D.C. (Morley), Ltd.—Capital, £4,000 in £1 shares. Return dated December 5th, 1930 (filed February 24th, 1931). 2,400 shares taken up. £2,400 paid. Mortgages and charges, nil.

Electric Lamp Service Co., Ltd.—Capital, £2,000 in £1 shares. Return dated January 14th (filed April 23rd), 1931. 607 shares taken up. £607 paid. Mortgages and charges, nil.

Imeson & Finch, Ltd.—Capital, £2,500 in £1 shares. Return dated December 31st, 1930 (filed February 25th, 1931). £1,400 shares taken up. £1,400 paid. Mortgages and charges, nil.

Kye Electrical, Ltd.—Capital, £25,000 in 20,000 cumulative participating preference shares of £1 and 100,000 ordinary shares of 1s. each. Return dated December 30th, 1930 (filed January 6th, 1931). 12,502 preference and 92,500 ordinary shares taken up. £17,127 paid. Mortgages and charges, nil.

Automatic Wireless, Ltd.—Capital, £100 in £1 shares. Return dated December 31st, 1930 (filed February 18th, 1931). Four shares taken up. £4 paid. Mortgages and charges, nil.

R. J. Richardson & Co. (London), Ltd.—Particulars filed of £400 debentures authorised May 29th, charged on the company's undertaking and property, present and future, including uncalled capital, the whole amount being now issued.

City Notes

Rangoon Electric Tramway & Supply Co., Ltd.

Presiding at the annual meeting on June 2nd, Mr. W. A. W. Dawn (chairman), in presenting the report and accounts (ELEC. REV., April 17th, p. 682) said that the capital expenditure during 1930 amounted to £87,935, which was made up principally of the cost of the new boiler, extensions of mains, and new sub-stations, buildings and equipment. The good start they had made in the earlier months of the year under review was marred by a protracted dock strike, which was followed by a severe earthquake, riots, and a general uneasiness on the part of the public, and at the close of the year the serious unrest was still prevalent in the districts. The effect of the trade depression on the demand for electricity was felt only at the end of the year, and the receipts for the first quarter of the current year were practically equal to those of the same period of 1930. There had been but a very small increase in new consumers during the year, as compared with the increase in previous years, due to the disturbed conditions in Rangoon. For some time past the board had had under consideration the question of reducing charges. An exhaustive inquiry was being made into the matter, and it was hoped before long to arrive at a decision at once satisfactory to the company and to consumers. The tramway receipts in 1930 showed a slight increase, as compared with the preceding year. Economies in this department had been effected, resulting in a reduction of costs. The renewal of the electrical equipment on the tramcars, begun in 1927, was completed last year, and the new motors were giving satisfactory service. The 'bus receipts also increased, due to new services and increased mileage run. The report and accounts were adopted.

Electric Supply Corporation, Ltd.

The accounts of this company were abstracted in our last issue, p. 970, and the annual meeting was held on June 8th, when Mr. J. G. B. Stone (chairman), who presided, in the course of his speech, said their own undertakings showed a slightly greater net increase in lamp connections as compared with the preceding year. The subsidiary companies showed a decided step forward. Steyning was still waiting for a bulk supply and standardisation of the system, but the Haywards Heath, Uckfield, Hassocks and Hurstpierpoint areas were now supplied in bulk from the Central Electricity Board. The work of changing the system of supply was proceeding at Chelmsford, under the terms of an agreement with the Chelmsford Corporation. The sale of the Hitchin undertaking was unavoidable, the Urban District Council having exercised its statutory rights. They had disposed of their small holding in the Dawlish Electric Light and Power Co., but had increased their holding in the Hendon Co. The business of the Petersfield Co. was extending rapidly under the new bulk supply conditions; the Newhaven and Seaford Co. had extended its operations into the rural areas; and although the Peterhead company had not yet reached the profit-earning stage, it had increased its connections. They had written the Dumbarton Tramways and Omnibus Companies right out of their investment account. Mr. K. A. Scott-Moncrieff, in seconding the resolution for the adoption of the report and accounts, referred to statements made by people who had returned from Switzerland to the effect that the use of electricity in remote villages and farmhouses in Switzerland was due to the abundant water power supply. That was all nonsense, the real reason being the availability of overhead lines. The report and accounts were adopted.

Meters, Ltd.

Presiding at the annual meeting on June 9th, Mr. G. H. Braddock (chairman), in the course of his speech, said that the widespread trade depression had reduced their turnover. This was chiefly due to the state of trade in the textile industry. The unsatisfactory conditions obtaining in Australasia and other countries had also had an adverse effect upon their output. Their subsidiary, British Electric Meters, Ltd., continued to make good progress, and they might have to make early provision to enable it to deal with the growing business.

Callender's Cable & Construction Co., Ltd.

The directors' report for the year ended December 31st last shows a credit balance of £320,036 on the profit and loss account, as compared with £403,912 for 1929. To this is added £428,825 brought forward, making £748,564. After meeting depreciation, debenture interest, preference dividends, and pension fund contribution, there remains a balance of £619,064, of which £100,000 is transferred to the renewals and contingencies account. It is proposed to maintain the ordinary dividend at 15 per cent. by making a final distribution of 2s. per share, less tax; this will leave £351,664 to be carried forward. In view of the unfavourable conditions of industry and finance all over the world, the result is considered satisfactory. The reserve now amounts to £800,000. The past year was a difficult one; all the commodities which the company em-

ploys in the course of its manufactures fell in price to an almost unprecedented extent. On the other hand, the extension of the use of electricity both for light and power, especially for household use, still continues without diminution, and the demand for cables and wires necessary for this development has been not only satisfactory but has proved a useful source of revenue to the company. The business of the Anchor Cable Co., although somewhat reduced from the previous year, continues to be substantial and shows excellent results. Foreign trade has been disappointing owing to financial stringency and especially to the crisis in Australia and the unrest and rioting in India. In spite of this, the company's Indian business has been reasonably satisfactory and has returned a fair profit, thanks to considerable contracts which are now in course of execution. The work upon the South-Eastern Grid has proceeded throughout the year, and the sections between Brighton, Eastbourne, Hastings and Folkestone have been completed and put into operation. The financial crisis in the United States has interfered with the progress of the subsidiary company there; it has, however, succeeded in maintaining its position without loss, and looks confidently to the future. In July last Mr. Theodor Petersen, M.I.E.E., was appointed assistant managing director, with a seat on the board. Mr. Thomas O. Callender, the son of the managing director, has been appointed an advisory director. Meeting: June 17th.

Electric Construction Co., Ltd.

The annual meeting was held on June 4th at the offices of the company, Ingersoll House, Kingsway, Mr. James Gray (chairman), presiding. In presenting the report and accounts (ELEC. REV., June 5th, p. 970), the chairman said that he much regretted having to submit accounts showing a net loss. Throughout the whole of its previous history the company had shown only one loss, and on that occasion it was a small amount. The loss during the past year had been due to circumstances over which they had no control. The depression in the heavy industries had re-acted upon the company very severely, as much of the business was obtained from these sources. For that class of work, moreover, competition, although acute, was never excessive, quality and reliability being a *sine qua non*. The demand, however, during the past year had been practically non-existent, and there was still no sign of a revival. The demand for export had also contracted. In former years they had had a large connection in Australia, but, in consequence of the highly protective policy adopted by that Dominion, followed by the financial crisis, which still prevailed, that market had been practically closed for the time being for such plant as they manufactured. The Grid, too, had not, on the whole, helped companies such as theirs as much as had been anticipated. Formerly, a large amount of plant had been required for independent generating stations of medium sizes, but this class of work had been gradually reduced, which had counterbalanced the increasing demand for motors which had arisen under the new regime. Any improvement in the company's affairs would be influenced by an improvement in trade generally, but of this there was at present not much indication. Two or three months ago there had been a feeling that the depression had touched bottom, but it was now generally recognised that recovery was going to be protracted, and would have to be preceded, or accompanied, by the re-adjustment of international financial conditions. The report and accounts were adopted and the re-election of Mr. W. M. Furniss to the directorate was carried unanimously.

British Electric Traction Co., Ltd.

The gross profit for the year ended March 31st last amounted to £422,827 (against £396,261 in the previous year), and after deducting general expenses, staff endowment fund, debenture, &c., there remains a balance of £271,005, being an increase of £17,924 over the previous year. The directors recommend the payment of dividends of 8 per cent. on the preferred ordinary stock and 5 per cent. on the deferred ordinary stock, leaving a surplus of £112,917. It is proposed that out of this balance £18,445 be capitalised and distributed to the deferred ordinary stockholders in fully paid deferred ordinary shares of £1 each, to be converted subsequently into deferred ordinary stock. The preference stockholders will then receive a further dividend of 2 per cent. (making 8 per cent. for the year), leaving a balance of £80,217 to be added to undivided profits account. The undivided profits account now stands at £1,309,983.

The report of the *Anchor Cable Co., Ltd.*, shows a profit of £65,015, as against £77,126, to which is added £171,436 brought in, making £236,451. After deducting depreciation, debenture interest, &c., a final dividend of 15 per cent. is proposed, making 20 per cent. for the year (same), leaving £183,202 to be carried forward.

The directors of *Ruston & Hornsby, Ltd.*, have announced that they will not pay the dividend on the preference and ordinary shares for the year ended March 31st last. The debit balance includes provision for losses on the Australian exchange, and the charge for depreciation has been placed against capital reserve. It is reported that depression has been much more severe, and much of the business obtained has been at unremunerative prices owing to keen competition. The salaries of the office staff and the remuneration of the directors are to be reduced by 10 per cent.

The gross earnings and other income of the *Associated Gas and Electric System* for the year ended April 30th last amounted to $111,656,891, as compared with $103,846,196 in the preceding year. Operating expenses totalled $64,693,570 (against $56,939,669), leaving net earnings of $46,963,321 ($46,906,527).

The *Para Telephone Co.* has announced a final dividend of 3 per cent., less tax, in respect of the year ended December 31st last.

According to the *Financial Times*, the directors of *Low Temperature Carbonisation* are seeking sanction to extend for five years the term of the 8 per cent. prior lien debentures which fall due for repayment on July 1st next.

The *Lima Light, Power and Tramways Co.* has announced that owing to the depreciation which has taken place in Peruvian currency, the interest due on July 1st on the 8 per cent. cumulative preference shares will not be paid.

The directors of *Mirrlees, Bickerton & Day, Ltd.*, have announced that no dividend will be paid on the ordinary shares for the year ended March 31st. The previous year's dividend was 7 per cent.

The *Associated Telephone and Telegraph Co.* has announced a dividend of $1 per share and a participating dividend of $0.50 per share on the class "A" stock, payable July 1st.

The *Great Northern Telegraph Co., Ltd., of Denmark* has declared an interim dividend of 2½ per cent., less tax.

Stocks and Shares

TUESDAY EVENING.

THE prices of stocks and shares continue to reflect fairly faithfully the disturbed conditions that prevail in the counsels of the nations. Politically, quite as much as financially, the elements that make for disturbance appear to be increasing rather than diminishing. The visit of the German statesmen to Mr. Ramsay Macdonald has introduced a new note of unsettlement in regard to reparation payments. The recommendations of the "Dole Commission" would be welcomed were it not for the impression that the Government is not at all likely to act upon the sensible suggestions put forward. The anticipation of finance looks constantly for some conversion scheme of the 5 per cent. War Loan to be put forward in order to save the country interest, and to assist the equilibrium of the next Budget. All these factors combine to compel money to seek the shelter of the safety-first securities, with the result that British Government stocks not only maintain their prices, but steadily improve almost week by week.

Gilt-Edged Strength

Central Electricity Board 4½ per cent. debenture is being recommended in responsible quarters in exchange for certain other stocks whose security is likely to be weakened by the depressing conditions that prevail throughout the world. The price has risen 1½ to 97½ ex dividend. London & Home Counties debenture at 98 is very firm. London Power 5 per cent. debenture stock is on offer at 106, free of stamp, at which the return on the money is £4 14s. 3d. per cent., but, as mentioned the other day, the stock is liable to be drawn at 100 by means of the sinking fund which is now in operation. New Zealand has offered £5,000,000 short-dated bonds this week at 99, the greater part of the proceeds being allocated to productive purposes, such as the development of hydro-electric power works, telephone and telegraph extensions, &c. Considerable amounts will again be spent in Great Britain, says the prospectus, in the purchase of material required for these purposes. Underwriters of the issue were left with 68 per cent. of the total. West Midland Joint Electricity 5 per cent. debenture, at 103, has risen two points.

Electricity Supply Shares

Metropolitan Electric ordinary shares have fallen 1s. 9d. to 39s. 3d., for no particular reason other than the necessity of obtaining money by people who require cash for the purpose of meeting other obligations. Moreover, at the present price of 39s. 3d., the yield on the money is no more than £5 2s. per cent., which looks modest, even in these days when first-class industrials are difficult to obtain by the investor who wants more than 5½ per cent. County of London ordinary are 1/16 lower at 43s. 9d., the decline being due to the same reason as that which operates in the case of Metropolitans. The yield here is £4 11s. 5d. per cent. On the other hand, Brompton ordinary and St. James' ordinary are both 6d. up at 28s. 6d. and 29s., respectively. Although the return on the money, on the basis of the 7 per cent. standard rate which will come into force after the end of this year, is small, the possibility of the companies being able to show a better return to their proprietors is sufficient to recommend London Electricity Supply shares to the cautious purchaser.

The County of London Electric Supply Co., which at the beginning of April this year redeemed half-a-million pounds of its 7 per cent. debenture stock, has placed, during the past few days, a similar amount of 5 per cent. debentures, dated 1965-1972. The terms are not announced, as the stock was placed privately. No doubt it will be marketed in due course.

In the provincial group the only change is a small decline in Midland Electric Power shares to 27s.

Cables and Wireless

A florin rise in Marconi Marine shares to 32s. is taken to show that the forced liquidation in these shares has come to an end. As mentioned here last week, the yield on the money,

at the previous price of 30s., was 10 per cent. In view of the progress that the company is making, notwithstanding the difficulties of the times, Marconi Marines at anything like the present price of 32s. can scarcely be counted dear. Anglo-American Telegraph preferred stock has strengthened to 104, in consequence of the slightly better tendency which has lately been prevailing in New York for prior charge industrial securities. The deferred stock, on the other hand, is 10s. lower at 25. Cables & Wireless stocks are a shade harder, the 5½ per cent. preferred moving up to 51¼, and the "A" ordinary stock to 12. These improvements have not sufficed to save a fall of £1 in Globe Telegraph & Trust ordinary, and of 10s. in the preference. The latter have gone back to 8½, at which price the return on the money is £7 1s. 2d. per cent., a yield which Globe preference have not offered for years past. The Great Northern Telegraph Company has declared an interim dividend of 2½ per cent., payable on the 1st of this month, this being at the same rate as usual. The price of the shares is 10s. up at 25¼. Anglo-Portuguese Telephones eased off to 17s. 6d.

Direct Spanish Telegraph preference have strengthened to 6¼. The price of the ordinary shares remains at £7 nominal. The last bargain marked in the shares was at 10¼, on the 1st. April, 1930. Eastern Telegraph 3½ per cent. preference changed hands a few days ago at 63, and Eastern Extension 4 per cent. mortgage debenture stock at 80¾. Jutland Telephone 5¼ per cent. bonds, guaranteed by the Danish Government, came into request at 102¼. In the American group, International Telephone & Telegraph, at 26½, are a point higher, on the satisfactory report to which reference was made here last week. American Telephone & Telegraph, at 174¼, have risen 9½ points.

Home Railways and Tractions

No changes have occurred in the list of the Underground group. The company's £1 shares pay 8 per cent. on the basis of the last declared dividend. The present price is the lowest touched since 1927, when at one time the shares were 12s. 3d. The lowest reached during the past decade has been 4s. 3d. ten years ago, and the highest 28s. 6d. in 1929. Reorganisation of the capital took place in 1926, when eleven £1 shares were given for ten of the old "A" shilling shares. There is on offer in the market £2,000 Central London 4½ per cent. redeemable debenture, 1942-1972, and £8,000 City & South London similar stock, at 100¾ in each case. These prices are ex the interest due on July 1st. The yield on the money is practically 4½ per cent., and both stocks are eligible for trustee investment. Of the London Electric prior-charge issues, £1,000 5 per cent. redeemable debenture, 1985-1995, can be bought at 106, this giving 4¼ per cent. on the money, and being cum the dividend due on July 1st.

British Electric Traction reports a net balance for the year recently ended of £271,000, an increase of £18,000 over the previous year. The cash dividend on the deferred ordinary stock will be again 5 per cent., for the fourth year in succession. A bonus of 10 per cent. in fully paid ordinary shares of £1 each, to be converted subsequently into stock, will also be paid. The preference stockholders again receive 8 per cent. for the year. The fact of the B.E.T. Company paying its bonus in stock makes it practically impossible to work out the yield which a buyer receives at the present price, owing, of course, to the variations which occur in the quotation for the stock. This is the reason for the blank space left in the yield column of our price lists. The price of the deferred stock is 975; the 6 per cent. cumulative participating preference, which receives 8 per cent., changed hands at 133 on Monday.

Cable Equipment Shares Better

Callender's Cable & Construction Company has done very well in maintaining its ordinary share dividend at 15 per cent. for the year, for the twelfth successive time. The profits are £83,000 down at £320,000, but the company occupies a strong financial position, the reserve being £800,000. The carry-forward to the current year is £351,664. Callenders stand at 2 7/16, at which the yield on the money is £6 3s. per cent. G.E.C. ordinary at 36s. are few pence higher, and Siemens have risen 1s. 9d. to 22s. 6d. Henley's are ¼ up at 4¼. Crompton Parkinsons have gone back to 17s. 6d., and the second preference are a little lower at £1. Amongst the American utilities, a modest recovery has occurred after the slump of last week. Montreal Light & Power at 43, and Power Corporation of Canada at the same price, are 1½ and 3 points better. Shawinigan, which fell to 36¼, has recovered to 40.

The Canadian Government has imposed a tax of 2 per cent. on dividends paid to non-resident shareholders. This does not apply to fixed interest bearing securities, but will be levied upon dividends on ordinary shares held by proprietors non-resident in Canada, wherever they may be registered.

The Madras Electric Supply Corporation has declared a dividend of 5 per cent. tax free for the year, the same as that in the previous twelvemonth. In spite of the unsettled conditions in the country this company has made good progress, and the price of the ordinary shares is quoted at 25s., the 5½ per cent. tax free preference standing at 21s. 3d.

Few alterations of consequence have occurred amongst iron and steel shares. Vickers are a shade better at 6s. 4½d. Philips' Incandescent ordinary remain at 18s. 9d. The rubber share market fails to exhibit any resiliency. The Lima Light, Power and Tramways Company announces that, owing to the depreciation in Peruvian currency, the dividend due next month on the 8 per cent. preference shares will not be paid.

Share List of Electrical Companies

Home Electricity Companies

	Nom.	Approx. Dividend 1929.	1930.	Price June 9 1931.	Rise or fall.	Yield p.c.
Bournemouth and Poole	£ 1	15	15	58/9	—	5 2 2
Brompton Ordinary	1	8½	8½	28/6	+6d.	4 18 3
Central Electricity 4½% Deb. ...	Stock	—	4½	97½	+1½	4 12 6
Charing Cross Ordinary	1	8½	8½	29/6	—	4 15 0
Chelsea	1	8⅝	8⅝	27/6	—	5 1 10
City of London	1	10	10	96/3	—	5 10 3
Clyde Valley	1	8	8	32/-	—	5 0 0
County of London	1	7	10	43/9	—⅛	4 11 5
Edmundsons' 7% Pref.	1	7	7	25/6	—	5 9 10
Elec. Supply Corporation	1	11	11	42/6	—	5 3 9
Kensington Ordinary	1	8	8	30/-	—	4 13 4
Lancs. Light and Power	1	7	6½	21/3	—	6 2 4
London & Home Counties 4½% Deb.	Stock	—	—	98	—	4 12 0
London Electric	1	8½	9	34/-	—	5 5 11
Metropolitan	1	9	10	39/3	—1/6	5 1 11
Midland Counties	1	6½	7	26/3	—	5 6 8
Mid. Elec. Power	1	15	8	27/-	—6d.	5 18 6
Newcastle-on-Tyne Ordinary ...	1	6	6	21/3	—	5 13 0
do. 7% Pref.	1	7	7	27/-	—	5 3 8
Notting Hill 6% Pref.	10	6	6	11½	—	5 6 8
North Met. Elec. 6% Pref.... ...	1	6	6	24/-	—	5 0 0
St. James' and Pall Mall	1	8	8	29/-	+6d.	4 16 7
Scottish Power	1	8	8	27/6	—	5 16 5
South London	1	8½	8½	27/6	—	5 1 10
Urban Ordinary	1	7	7	28/-	—	5 0 0
Westminster Ordinary	1	8½	8½	28/6	—	4 18 3
Whitehall Elec. Invst. 7½% Pref....	1	7½	7½	24/6	—	6 2 5
Yorkshire Elec.	1	8	8	30/-	—	5 6 8

Home Rails

Central London Ord. Assented ...	Stock	4	4	76	—	5 5 3
Metropolitan	,,	4	3½	46½	—	7 10 6
do. District	,,	5	5	64½	—	7 15 0
Underground Electric	£1	8	8	90/-	—	8 0 0

Telegraphs and Telephones

Anglo-Am. Tel. Pref....	Stock	6	6	104	+½	5 15 5
do. Def-	,,	1½	1½	25	—½	6 0 0
Automatic Telephone	1	12½	12½	32/6	—	7 18 10
Cables & Wireless 5½% Pref. ...	Stock	5½	5½	51½	+1	10 18 8
do. A 7½% Ord.	,,	Nil	—	12	+1	... ...
do. B Ord.	,,	Nil	—	7	—	... ...
Globe Tel. and T. Ord.	10	10	—	7½	—1	... ...
do. do. Pref.	10	6	6	8½	—½	7 1 2
Great Northern Tel.	10	20	20	25½	+½	7 17 6
Marconi-Marine	1	15	15	32/-	+2/-	9 7 6
Oriental Telephone Ord.	1	12	12	2½	—	*5 6 8

Home and Foreign Trams, &c.

Anglo-Arg. Trams First Pref. ...	5	5½	—	12/6	—	... ...
do. do. 2nd Pref. ...	5	6	—	7/6	—	... ...
do. do. 5% Deb. ...	Stock	5	5	39½	—	21 7 0
British Electric Traction Def. Ord.	,,	5	5	975	—50	... ...
do. do. Pref. Ord. ...	,,	8	8	122½	—	6 10 8
Brazil Traction	100	8	—	14½	+1½	... ...
Brit. Columbia Elec. Rly. Pce. ...	Stock	5	5	97½	—	5 2 7
London & Sub. Trac. 5% Pref. ...	1	Nil	Nil	11/6	—	... ...
London United Tram Deb. ...	Stock	4	4	69½	—	5 8 0
Mexico Trams, 5% Bonds	—	5	5	42½	—	11 15 4
Mexican Light Common	100	Nil	Nil	87½	—1	... ...
do. 7% Pref.	100	7	7	66½	—	10 10 6
do. 1st Bonds	—	5	5	77	—2	6 9 10
Victoria Falls Ord.	1	15	15	57/6	—	5 4 2
Yorkshire (West Riding)		Nil	Nil	5/6	—	... ...

Manufacturing Companies

Assoc. Elec. Ord.	1	6	6	18/6	—	6 9 9
do. Pref.	1	8	8	27/6	—	5 16 0
Babcock & Wilcox	1	15	14	41/3	—	*6 16 0
British Aluminium Ord.	1	10	10	25/-	—	8 0 0
British Insulated Ord.	1	15	15	3⅜	—	5 14 2
Brush Ord.	Stock	10	5	60xd	—	8 5 0
Callenders	1	15	15	2 7/16	—	6 3 0
do. 6½% Pref....	1	6½	6½	25/-	—	5 4 0
Crompton Parkinson Ord.	5/-	90	90	3	—⅛	8 11 5
do. 8% Pref.	1	8	8	28/-	—	5 14 5
Edison-Swan 1st Pref.	1	7½	7½	23/9	—	6 6 4
do. 5% Deb.	Stock	5	5	94½	—	5 5 10
Electric Construction	1	5	Nil	11/3	—	... ...
Enfield Cable Ord.	1	25	25	3⅜	—	6 14 1
English Electric	1	Nil	Nil	5/-	—	... ...
do. do. Pref.	1	Nil	Nil	5/-	—	... ...
Ferranti Pref.	1	7	7	21/-	—6d.	6 10 4
G.E.C. Pref.	1	6½	6½	26/-	—	5 0 0
do. Ord.	1	14	...	36/-	+3d.	7 15 4
Henley	1	30	...	4¼	+¼	6 6 4
do. 4½% Pref.	5	4½	4½	4¾	—	5 2 10
India-Rubber	1	Nil	Nil	4/6	—6d.	... ...
Johnson & Phillips	1	10	10	27/6	—	7 5 6
Siemens Ord.	1	7½	7½	22/6	+9d.	6 13 4
Telegraph Construction	12	10	7½	13	—	6 18 8

*Dividends paid free of Income Tax.

The Electrical Trade of Austria

Figures for 1929 and 1930 compared

THE following tables give particulars of Austria's imports and exports of electrical machinery and apparatus in 1930, the total values in schillings (34½ schilling=£1), together with the total weights in quintals and the weights by countries of origin or destination. Comparative figures for 1929 are given, where available, for purposes of comparison, and notes are added of increases or decreases :—

Imports

	1929.	1930.	Inc. or dec.
Dynamos and motors (except for motor cars)—			
Value in 1,000 schilling ...	9,410	5,390	− 4,020
Weight in quintals	15,130	7,950	− 7,180
From Germany	9,260	4,880	− 4,380
,, Hungary	1,500	800	− 700
Dynamos and motors connected with mechanical plant—			
Value in 1,000 schilling ...	2,240	1,890	− 350
Weight in quintals	1,300	1,340	+ 40
From Germany	1,190	1,030	− 160
Static transformers—			
Value in 1,000 schilling ...	2,650	3,650	+ 1,000
Weight in quintals	4,500	7,790	+ 3,290
From Germany	3,220	6,700	+ 3,480
Rotary transformers—			
Value in 1,000 schilling ...	110	80	− 30
Weight in quintals	220	100	− 120
From Germany	100	72	− 28
Telephone apparatus—*			
Value in 1,000 schilling ...	5,650	2,860	− 2,790
Weight in quintals	1,750	940	− 810
Radio apparatus—			
Value in 1,000 schilling ...	7,610	5,930	− 1,680
Weight in quintals	890	850	− 40
From Germany	380	340	− 40
,, Holland	390	320	− 70
Röntgen and electro-medical apparatus—*			
Value in 1,000 schilling ...	1,230	1,450	+ 220
Weight in quintals	660	660	—
Electricity meters and measuring apparatus—			
Value in 1,000 schilling ...	3,100	3,470	+ 370
Weight in quintals	1,190	1,210	+ 20
From Germany	860	700	− 160
,, Switzerland	220	380	+ 160
Incandescent lamps—			
Value in 1,000 schilling ...	3,670	2,710	− 960
Thousands	3,150	2,650	− 500
From Germany	2,450	2,400	− 50
Heating and cooking apparatus and electric irons—*			
Value in 1,000 schilling ...	670	400	− 270
Weight in quintals	660	430	− 230
Other electrical apparatus—			
Value in 1,000 schilling ...	13,700	11,900	− 1,800
Weight in quintals	12,620	9,940	− 2,680
From Germany	10,250	7,960	− 2,290
Lead-covered cable—*			
Value in 1,000 schilling ...	77	110	+ 33
Weight in quintals	290	480	+ 190
Other cables and insulated wire—			
Value in 1,000 schilling ...	1,340	910	− 430
Weight in quintals	1,800	1,250	− 550
From Germany	890	740	− 150
,, Switzerland	480	330	− 150
Accumulators and plates—			
Value in 1,000 schilling ...	370	280	− 90
Weight in quintals	600	580	− 20
From Germany	330	325	− 5
,, Great Britain	130	100	− 30

* Mainly from Germany.

Exports

	1929.	1930.	Inc. or dec.
Dynamos and motors—			
Value in 1,000 schilling ...	10,290	9,690	− 600
Weight in quintals	22,110	22,050	− 60
To Russia	†	3,480	—
,, Germany	1,950	1,140	− 810
,, Poland	4,230	4,160	− 70
,, Rumania	2,760	2,300	− 460
,, Jugo-Slavia	2,110	2,570	+ 460
,, Czecho-Slovakia	2,080	3,500	+ 1,420
Dynamos and motors connected with mechanical plant—			
Value in 1,000 schilling ...	1,780	1,540	− 240
Weight in quintals	700	620	− 80
To Great Britain	80	45	− 35
,, Czecho-Slovakia	190	110	− 80
,, Russia	130	160	+ 30
Static transformers—			
Value in 1,000 schilling ...	5,450	6,700	+ 1,250
Weight in quintals	13,000	17,570	+ 4,570
To Germany	660	2,780	+ 2,120
,, Poland	4,440	1,550	− 2,890
,, Rumania	1,070	1,350	+ 280
,, Jugo-Slavia	1,400	2,120	+ 720
,, Russia	2,190	7,280	+ 5,090
Telephone apparatus—			
Value in 1,000 schilling ...	8,800	4,840	− 3,960
Weight in quintals	2,470	1,270	− 1,200
To Germany	370	120	− 250
,, Great Britain	†	130	—
,, Czecho-Slovakia	460	170	− 290
,, Netherlands	110	330	+ 220
,, China	250	85	− 165
Radio apparatus—			
Value in 1,000 schilling ...	13,700	14,670	+ 970
Weight in quintals	4,090	4,160	+ 70
To Germany	390	550	+ 160
,, Great Britain	1,060	660	− 400
,, Italy	310	320	+ 10
Electricity meters and measuring apparatus—			
Value in 1,000 schilling ...	2,320	2,300	− 20
Weight in quintals	1,130	1,450	+ 320
To Greece	200	240	+ 40
,, Great Britain	90	70	− 20
Incandescent lamps—			
Value in 1,000 schilling ...	19,920	18,360	− 1,560
Thousands	16,580	16,310	− 270
To German Free Ports ...	808	840	+ 32
,, Germany	1,260	1,580	+ 320
,, Great Britain	4,550	6,090	+ 1,540
,, Italy	1,730	1,570	− 160
,, Czecho-Slovakia	1,410	860	− 550
,, India	240	340	+ 100
,, Egypt	290	300	+ 10
,, United States	1,860	850	− 1,010
Heating and cooking apparatus and electric irons—			
Value in 1,000 schilling ...	830	920	+ 90
Weight in quintals	880	860	− 20
To Germany	50	70	+ 20
,, Italy	85	75	− 10
,, Jugo-Slavia	90	100	+ 10
,, Rumania	90	150	+ 60
Other electrical apparatus—			
Value in 1,000 schilling ...	12,780	12,620	− 160
Weight in quintals	20,050	18,630	− 1,420
To Germany	1,450	1,180	− 270
,, Italy	370	200	− 170
,, Poland	1,930	860	− 1,070
,, Rumania	1,210	2,500	+ 1,290
,, Jugo-Slavia	1,190	1,120	− 70
,, Czecho-Slovakia	1,140	1,040	− 100
,, Russia	†	4,060	—
,, Great Britain	5,240	4,570	− 670
Röntgen and electro-medical apparatus—			
Value in 1,000 schilling ...	1,140	1,340	+ 200
Weight in quintals	710	690	− 20
Lead-covered cable—			
Value in 1,000 schilling ...	1,890	3,380	+ 1,490
Weight in quintals	9,100	15,900	+ 6,800
To Belgium	520	4,970	+ 4,450
,, Great Britain	†	2,540	—
,, Rumania	2,250	1,530	− 720
,, Jugo-Slavia	2,450	2,600	+ 150
,, Dutch East Indies ...	†	2,350	—
Other cables and insulated wires—			
Value in 1,000 schilling ...	2,570	2,150	− 420
Weight in quintals	4,650	4,330	− 320
To Great Britain	730	850	+ 120
,, Rumania	360	510	+ 150
,, Jugo-Slavia	280	430	+ 150
,, India	†	370	—
,, Uruguay	100	210	+ 110
Accumulators and plates—			
Value in 1,000 schilling ...	600	340	− 260
Weight in quintals	1,960	1,300	− 660
To Jugo-Slavia	690	880	+ 190

† Not specified.

South African Electrical Requirements

The Position of British Suppliers in an Expanding Market

THE Senior Trade Commissioner in South Africa has prepared a report for the Department of Overseas Trade on the market for electrical contractors' supplies in the Union. This constitutes a useful survey of the electrical prospects in general and gives an idea of the classes of electrical equipment in the greatest demand.

All possible steps are being taken by the larger supply undertakings and other interested bodies to popularise the use of electricity and these efforts are being attended by considerable success; the market is growing rapidly.

Electricity Supply Progress

The latest figures given in the report—those for the year 1928-29 show that the total amount of energy generated by public and private plants was over 2,300 million kWh, of which the mines took over half. Industrial establishments consumed 213 million kWh, private consumers 119 millions, and the railways 157 millions. The annual increase in domestic consumption has been of the order of 18 per cent. In the two principal cities the number of consumers increased substantially during the last five years, for which figures are available: in Cape Town the number rose by 53 per cent. and in Johannesburg by 44 per cent.

The Electricity Supply Commission was appointed in 1923 to establish undertakings to provide an efficient supply of electricity. By 1929—six years from its inception—five undertakings were in operation with an output of about 199 million kWh per annum. As a result, a number of outlying districts are now supplied with electricity, and there is no doubt that other districts will in time enjoy similar facilities. Durban, Pietermaritzburg and nearly 20 small towns draw their supply from the Commission; another 30 small towns are supplied by the Victoria Falls and Transvaal Power Co., Ltd., the South African Railways or other sources of bulk supplies; while Cape Town, Johannesburg, Port Elizabeth, Pretoria, Bloemfontein and, perhaps 120 other places have their own generating stations. At least fifteen extensions to existing plants are under construction or being considered at the present time.

Development Methods

As we have already reported, the South African Electrical Development Association is now well under way, support having been obtained from, or promised by, the supply undertakings and the trade; and the South African Electric Lamp Association opened a lighting service bureau in Johannesburg last year Some views of this bureau were published in our issue of June 13th, 1930. Similar establishments in Cape Town and Durban are under consideration.

In Cape Town the municipal undertaking has opened showrooms in various districts where fittings and appliances are displayed and expert advice is given regarding the articles exhibited, the prices of energy, &c. In Johannesburg a very representative electrical exhibition was recently held in the City Hall, and there are usually good electrical exhibits at the principal agricultural shows. In most of the large centres the authorities have instituted assisted wiring schemes, and deferred payment schemes are also in operation for the purchase of apparatus and utensils. Advertising in the Press by the agents for manufacturers of electrical appliances appears to be increasing, and the newspapers often support this advertising by inserting in adjacent columns interesting articles on the uses of electricity.

Wiring Rules and Standards

Regulations, based on the I.E.E. Wiring Rules, are in force in Cape Town, Johannesburg, and Durban. Only in exceptional circumstances is wiring other than in conduit permitted. Power points are sometimes installed after premises have been completed, and it is usual in such cases to use lead-covered cable. In exposed positions or where the conduit is embedded in walls, welded conduit is employed, but for ordinary surface work the close-joint type is used. Fuse and switch-fuse boxes are usually of the ironclad type, while teak or other hardwood is common for distribution boards. The bayonet type of lampholder is almost exclusively used, exceptions sometimes being made for lamps of 300 W or over. Tumbler switches are in general use. In Cape Town the three-pin pattern plug is insisted upon, but the regulations in this matter vary in different parts of the country.

Sources of Supply

Parallel with the advance in the consumption of electricity there has been a continued increase in imports of electrical plant and apparatus during the past few years. In this respect 1929 was a record year the total value of electrical equipment imported (excluding incandescent lamps and radio, telephone, and telegraph apparatus) being £2,615,816, as compared with £2,180,851 in 1928, and £880,086 in 1922. At present there is practically no South African production of these goods apart from special and high-priced silk shades.

The bulk of the imported material comes from Great Britain. The report does not give details of the trade, but in our issue of July 11th last we published figures for the year 1929. It was clear from these that the principal competition came from the United States and Germany. We also showed that while the total imports of this class increased by about 20 per cent., Great Britain's share rose by only 14.5 per cent.; no particular competitor benefited from the fall in the British proportion, our loss being shared equally among several countries. With regard to contractors' supplies, particularly, Germany is said to be our chief competitor. Although municipal and provincial regulations usually demand that every installation shall conform with the I.E.E. Wiring Rules and that fittings shall be up to the requirements of the British Engineering Standards Association, foreign makes of fittings are generally used on account of their lower cost. Only for important work in public buildings, and the best type of private houses are British fittings usually specified. German made fittings are seen in the whole range of goods; Czecho Slovakia supplies porcelain goods, such as ceiling roses, cut outs and counter-balances, as well as shades and other glass ware; French lampholders and switches are stocked; and a few lines are imported from the United States of America, although American productions are usually too expensive for the market.

The Selling Organisation

The principal importers are important firms of electrical engineers and, almost invariably, the contractors obtain their supplies from them. These firms, some of whom are branches of British and Continental concerns, only import the lines for which they hold agencies, and there are no large wholesale merchants who buy in the open market. The competition among electrical contractors is very keen and they are thus driven to base their quotations on the very cheapest material available, regardless of quality or the country of origin. This feature of the trade makes it almost impossible to report in detail on the special requirements of the South African market. Moreover, the electrical firms supplying the contractors have experienced the utmost difficulty in obtaining payment, and it has been found that contractors buy from one dealer until their credit is exhausted, when they endeavour to open an account with another dealer. Thus the nature of the demand for electrical accessories is governed more by the willingness or ability of the merchant-agent to give credit to the contractor than by the suitability of any particular article for the market. In Cape Town the supplying firms have been obliged to form a common pool in order that they may know the amount of credit allowed to the various contractors in the district. Efforts to form similar pools in other centres have not been successful although the need for some kind of protection is equally apparent.

British manufacturers appear to be well represented in the market, and, as already mentioned, some of the larger firms have their own South African branches. The general view is that British firms have very little to fear so far as the better class goods are concerned but, unfortunately, these form a very small part of the demand.

There are no special features as regards packing, the methods adopted for other markets being suitable for South Africa. No special regulations affecting the importation of electrical goods are imposed by the Union Government.

The Persian Electrical Market

PERSIA is not at present an important market for electrical goods, but a recent D.O.T. Consular report suggests that there are possibilities of increased business in contractors' supplies owing to the adoption of electric lighting in most large Persian towns. There is, however, serious competition from cheap German, and cheaper Russian, products.

The only electrical trade statistics available relate to lamps. In 1929-30 the imports of these were valued at only £6,033, but this compared with £3,947 in the previous year. Great Britain's share increased from £141 to £803, although Germany and Russia remained the principal suppliers.

German concerns have a strong hold on the market. They accept 20 per cent. with orders and allow from six to twelve months' credit for the remainder and their prices are well below British prices. British goods are admittedly of superior quality, and a large importer has expressed the opinion that if prices were nearer a competitive level, and about six months' credit was allowed, they might secure a market.

There appear to be no wiring regulations in Persia. German standard accessories are common; the Edison screw lampholder is in general use, although the bayonet type is also to be seen; and the plugs usually employed are of the two-pin pattern. Information contained in the report shows that in general plants are all on the small side; the usual supply pressure appears to be 220 V.

It is suggested that catalogues of the cheapest electrical accessories with competitive prices should be sent to the Commercial Secretary in Tehran in the hope of interesting dealers. In the event of the British article being competitive, it would be worth while to send a representative to study the market and pave the way to increased trade when normal conditions return.

Correspondence

Correspondents should forward their communications as early as possible. No letter can be published unless we have the writer's name and address in our possession

The First Hundred Thousand

Referring to the leading article in your issue of Friday last and the query in your final paragraph, may I call your attention to the fact that the total number of consumers connected to our supply on March 31st last was 100,492, and on April 30th, 101,364?

The population of Leeds is approximately 480,000, exclusive of the Borough of Morley, which takes a supply from this undertaking in bulk. Later figures indicate that we have now over 102,000 consumers so that there can be no question of Leeds following the undertaking of any other city in England.

These creditable figures have also been achieved in spite of the competition of the local gas undertaking, which is also municipally owned.

C. NELSON HEFFORD,
General Manager,
Leeds, *June 8th*, 1931. Leeds Electricity Department.

Petrol-electric Vehicles

With reference to the letter from Messrs. T.S. Motors, Ltd., in your issue of May 1st, I desire to say that it must have been quite clear from my previous letter that I referred to the transmission in a particular omnibus mainly for the purpose of showing the superiority of a series-wound dynamo with divertor control. I therefore fail entirely to see that "the same general type of chassis and engine power" has any real relation to this important point. Apparently your correspondents have satisfied themselves with regard to my statements concerning the use of a series-wound dynamo.

Messrs. T.S. Motors, Ltd., have misinterpreted my use of the term "overspeed." I believe that the majority of your readers will have gathered that the term was intended to imply that, if the conditions are such that the normal maximum speed with a direct drive is arranged for, say, 30 m.p.h., then for infrequent speeds over this (*i.e.*, overspeed) it would be easy to revert to the electrical drive.

In many applications of my electro-mechanical drive a speed-increasing means will be used between the engine and the dynamo for a three-fold purpose: first, to provide the best gear ratio at the back axle; secondly, to decrease the weight of the dynamo; and, thirdly, to provide an "overdrive." If at any time the overdrive does not meet the requirements for any particular running condition, or when free-wheeling or "idling" are desired, it is, with a clutch such as is required for this drive, an almost effortless step to revert to the electrical machines.

The success of a transmission system embodying a series-wound dynamo and divertor control has been definitely established. The ability to connect, or disconnect, two shafts running at the same speed is, of course, one of the simplest problems in mechanical engineering. An engineer thus far satisfied would not have the least hesitation in carrying such a transmission into practice without further experiment. The clutch in such a system, perhaps pneumatically or electrically controlled, would be light in weight, and must in nowise be confused with the heavy duties required from a clutch employed for an ordinary gear drive.

I stated in my article that electro-mechanical drives have previously been proposed, and I agree with your correspondents that they have "been found wanting." May I, with due modesty, say that what had "been found wanting" was the simple means which I have evolved for carrying them into practical use.

Your correspondents have made great errors of assumption in their speculations regarding comparative performance, weight, and maintenance.

The electrical machines in a purely electrical drive attain very high temperatures and must perforce labour under the most strenuous conditions. They have nothing approaching the cooling conditions of an electro-mechanical drive. With the latter the dynamo and electro-motor are out of action electrically, and are under ideal cooling conditions for a goodly portion of the day's run. This reduces deterioration of the insulating materials and assists largely in maintaining a high factor of safety. The absence of shunt windings and a shunt resistance (both undesirable members in traction plant such as this) also increases the factor of safety. The average temperature being less, the average efficiency will be increased, perhaps more than one unacquainted with the heavy C^2R losses would expect.

As regards the comparative engine conditions, if in a purely electrical drive, say, 60 b.h.p. is required from the electro-motor or transmission shaft, the engine has to develop about 80 b.h.p., and so on. It can, however, be easily and conveniently arranged for the engine and transmission to run at the same speeds for lengthy periods with an infinite number of varying outputs. By coupling the shafts under these conditions practically the whole of the power developed by the engine is utilised. When the speeds of the shafts synchronise in an ordinary electrical drive (a condition often occurring, especially with a high-speed engine) the drive becomes, in effect, simply an energy dissipator.

Consideration of the above points and my earlier remarks regarding "overdrive" and "idling" can leave no doubt as to the question of comparative maintenance and performance of the electrical machines and of the engine. In fine, with my transmission the maintenance and depreciation will be less. The weight (including the clutch) will be less than the weights published last year by your correspondents' engineer. The efficiency for a large percentage of time will be about 96 per cent., instead of about 75 per cent. with the ordinary electrical drive. There is a still more advantageous contrast in performance when used with a heavy-oil engine.

J. W. BURLEIGH.

Pasadena, Cal., U.S.A., *May 20th*, 1931.

The Royal Agricultural Show at Warwick

I am anxious to make available the fullest possible information with regard to the electrical exhibits that will be on view at the Royal Agricultural Show at Warwick next month (July 7th-11th).

If, therefore, there are any firms exhibiting electrical appliances who were not showing last year at Manchester, I shall be glad if they will let me have particulars of their exhibits.

ALEX. C. CRAMB,
Director and Secretary,
British Electrical Development Association, Inc.
London, W.C.2, *June 9th*, 1931.

Pole-line Insulation

In your issue of April 24th Mr. W. T. Taylor wrote an article advocating the use of "all-insulated" wood poles for high-voltage transmission lines. In it he stated that the bonding and/or earthing of ironwork on poles had been found from experience to be unsatisfactory and uneconomical. While not venturing to question the general correctness of his conclusions, I should be glad to hear his comments on the following breakdowns which have occurred on the system on which I work.

(1) On a wood-pole line at 3,300 volts, 3-phase, with insulator pins bonded together and connected to a continuous earth wire, two cases occurred of pole tops burning through at the points of attachment of uninsulated stay wires, the earth wire having become faulty.

(2) In 1929 some 3 miles of 3,300 volt, 3-phase wood-pole line was erected with no earth wire. On part of the line the insulators were bonded together but not earthed, and on part the pins were left unbonded. The line was put into commission and worked satisfactorily for a few months, when two cases occurred of pole tops catching fire on the part of the line with the unbonded insulator pins. The pins were consequently all bonded together, since when no trouble has occurred.

The conditions here are particularly hard on overhead systems, the ground being dry and sandy forming very bad earth contacts and the air being often wet and salty. There is practically no rain. The transmission system has an insulated neutral.

Peru, *May 19th*, 1931. H-J.

Leakage Trips for 100-A Circuits

Further to the correspondence on this subject, a recent enquiry for a 400-volt, 3-phase, 50-cycle control board, containing a 300, a 200, and five 100-amp. triple pole oil switches complete with the usual neutral links and enclosed bus-bar chamber, resulted in the following offer being received:—

As specified, complete with overload trips ... £140
Extra for earth leakage trips to comply with I.E.E. Regulation 94F, which will not operate on unbalance currents £95
e.g., an extra of 68 per cent.

Electrical installation engineers are still patiently awaiting the production of definite evidence to show that in a substantial number of electrical installations either (*a*) that switches fitted with earth leakage trips set *at or below* 100 amperes have operated to prevent serious danger or damage, or (*b*) that serious danger or damage would have been avoided had the switches been equipped with earth leakage trips set *at or below* 100 amperes.

Tenders are daily lost and won on smaller margins than £95.

R. GRIERSON,
Managing Director,
London, W.C.1, *June 8th*, 1931. Grierson, Ltd.

The Bury Improvement Class

Members of the "Improvement Class" formed by the staff of the Chamber Hall Power Station, Bury, visited the works of the Metropolitan-Vickers Co., Ltd., Trafford Park, on June 1st. In the various erection departments, in spite of the trade depression, a wide range of machines was seen in course of erection for home and foreign stations. The research laboratories were also included in the tour of inspection, a display of "manufactured lightning" being given. The visit concluded with afternoon tea in the canteen, when thanks were accorded to the company and its staff, Mr. Boothman, of the Manchester office, responding.

Published Specifications

Compiled expressly for this journal by a firm of chartered patent agents. The numbers in parentheses are those under which the specifications will be printed and abridged, and all subsequent proceedings will be taken.

1929

33,618. "Synchronising of alternating current generators." Akt.-Ges. Brown, Boveri et Cie. November 9th, 1928. (348,505.)

34,237. "Automatic electrical control of cyclic operations in mechanisms and other equipment." H. C. Jenkins. November 9th, 1929. (348,659.)

34,652. "Testing of the components of tuned electrical circuits." British Thomson-Houston Co., Ltd. November 13th, 1928. (348,554.)

34,776. "Electric switchgear." F. B. Cox. November 14th, 1929. (Patent of addition not granted.) (348,590.)

35,647. "Regulating systems for dynamo-electric machines." British Thomson-Houston Co., Ltd. November 21st, 1928. (348,710.)

36,178. "Diesel-electric ship's drive." Akt.-Ges. Brown, Boveri et Cie. December 10th, 1928. (348,508.)

37,361. "Electric vacuum switch apparatus." California Institute of Technology. December 26th, 1928. (348,555.)

37,857. "Totalising and indicating systems." British Thomson-Houston Co., Ltd. January 26th, 1929. (348,557.)

38,150. "Method for testing the insulation of electrical apparatus." A. G. Bullen, and E. L. Lee. December 12th, 1929. (348,559.)

38,504. "Firedamp-proof electric incandescent lamp." L. Mellersh-Jackson (Siemens-Schuckertwerke Akt.-Ges.). December 16th, 1929. (348,670.)

1930

511. "Electrical signalling systems for railways." S. Mattei, and E. N. Yzetta. January 6th, 1930. (348,512.)

607. "Manufacture of electric communication cables." Standard Telephones & Cables, Ltd., and K. E. Latimer. January 7th, 1930. (348,560.)

3,315. "Totalisators." Graham Amplion, Ltd., and J. Scowcroft. January 31st, 1930. (Cognate applications 4,640/30 and 5,747/30.) (348,514.)

3,424. "Electric totalisators." Automatic Telephone Manufacturing Co., Ltd., and F. T. Belas. January 31st, 1930. (348,515.)

3,662. "Correcting circuit for synchronous telegraph systems." Electrical Research Products, Inc., and F. C. Tomlins (W. A. Knoop). February 3rd, 1930. (Addition to 317,528; convention date not granted.) (348,595.)

3,942. "Apparatus for electrically heating rooms and buildings." J. Lightfoot. February 5th, 1930. (348,523.)

4,073. "Selector switches for telephone systems." A. Rosa. February 6th, 1930. (348,563.)

4,119. "Brush-holders for dynamo-electric machinery." Laurence, Scott & Electromotors, Ltd., E. Greenhalgh, and W. D. Torry. February 7th, 1930. (348,564.)

4,157. "Electric motor for phonographs and the like." J. Bethenod. November 7th, 1929. (Patent of addition not granted.) (348,525.)

4,166. "Synchronising apparatus for television receivers." Telehor Akt.-Ges. December 7th, 1929. (348,526.)

4,217. "Electric signalling systems." Western Union Telegraph Co. February 27th, 1929. (348,565.)

4,225. "Television and like apparatus." J. L. Baird, and Television, Ltd. (in liquidation). February 7th, 1930. (Cognate application 11,353/31.) (348,638.)

4,243. "Electrically-driven vehicles." C. Sacerdoti. February 7th, 1929. (348,527.)

4,494. "Submarine signalling cables." W. S. Smith, H. J. Garnett, and E. W. Smith. February 10th, 1930. (348,532.)

4,538. "Metal-vapour lamps." H. Stammreich. February 11th, 1930. (Convention date not granted.) (348,677.)

4,584. "Electric burglar alarms." H. J. Tibbles, and Rely-A-Bel Burglar & Fire Alarm Co., Ltd. February 11th, 1930. (348,571.)

4,600. "Electric condensers applicable also to other apparatus." R. Atkins, A. E. Frearson, and E. J. L. Delfosse. February 11th, 1930. (348,536.)

4,607. "Thermionic cathodes for electric discharge tubes." British Thomson-Houston Co., Ltd., and L. J. Davies. February 11th, 1930. (348,679.)

4,694. "Electrostatic loud speakers." A. Rauser, and W. Steuer. February 12th, 1930. (348,573.)

4,709. "Method of changing the characteristics of wireless valves to suit various requirements in wireless transmission and receiving systems." S. J. Anderson. February 12th, 1930. (348,540.)

4,737. "Distributer for use in telegraphy or the like." Standard Telephones & Cables, Ltd., and E. K. Sandeman. February 12th, 1930. (Addition to 36,396/29.) (348,543.)

4,738. "Telegraphic transmitter incorporating a mechanical relay." Creed & Co., Ltd., F. G. Creed, and R. D. Salmon. February 12th, 1930. (348,544.)

4,739. "Electric signalling systems." Standard Telephones and Cables, Ltd., E. K. Sandeman, and F. G. Filby. February 12th, 1930. (348,574.)

4,740. "Telephone systems." Standard Telephones & Cables, Ltd., and T. S. Skillman. February 12th, 1930. (348,545.)

4,747. "Impulse transmitter or sender for signalling systems, telephone systems and the like." Ericsson Telephones, Ltd., and P. Doig. February 12th ,1930. (348,546.)

4,794. "Electric pick-ups." R. L. Aspden. February 12th, 1930. (348,575.)

4,925. "Snap-action electric switches." H. F. Biggs. February 13th, 1930. (348,686.)

4,930. "Electric motors." R. E. Ollerenshaw. February 13th, 1930. (348,584.)

5,172. "Photo-electric cells." Westinghouse Electric and Manufacturing Co. February 20th, 1929. (348,693.)

5,466. "Voice-operated relay circuits." Electrical Research Products, Inc. April 18th, 1929. (348,704.)

5,809. "Telephone transmitters." Standard Telephones and Cables, Ltd., L. C. Pocock, V. B. C. Neilson, and R. Blackburn. February 21st, 1930. (348,716.)

5,998. "Means of control for wireless receivers." W. A. Stevens. February 24th, 1930. (348,727.)

6,088. "Control of electrical motors." F. A. Cam. February 24th, 1930. (348,732.)

7,488. "Electromagnetically-operated valves." J. L. Musgrave and R. Crittall & Co., Ltd. March 7th, 1930. (348,756.)

7,544. "Electric discharge devices." British Thomson-Houston Co., Ltd. March 7th, 1929. (348,757.)

8,001. "Junction boxes for electric conduits." H. J. Dean. March 12th, 1930. (348,765.)

8,147. "Telephone and like systems with amplifiers." General Electric Co., Ltd., and E. H. Cribb. March 13th, 1930. (348,768.)

8,284. "Magnet bobbins or coils for electrical apparatus, more especially for meters and other measuring instruments." Landis and Gyr Soc. Anon. July 2nd, 1929. (348,770.)

8,342. "Electric motor systems of the synchronous type." Gramophone Co., Ltd., C. O. Browne, and R. B. Morgan. March 14th, 1930. (348,773.)

8,987. "Methods of broadcasting by directional radiation." Telefunken Ges. für Drahtlose Telegraphie. April 24th, 1929. (348,784.)

9,667. "Induction motors." Siemens-Schuckertwerke Akt.-Ges. June 12th, 1929. (348,796.)

10,484. "Electric inductances." British Thomson-Houston Co., Ltd. April 16th, 1929. (348,807.)

10,801. "Electric motor controllers and the like." English Electric Co., Ltd., and F. Morris. April 4th, 1930. (348,815.)

11,031. "Wireless receiving apparatus." J. L. Routin. April 7th, 1930. (Addition to 316,985.) (348,823.)

11,486. "Electric fuses." F. Chambers. April 11th, 1930. (348,829.)

12,431. "Gas-tight seals for electric conductors." British Thomson-Houston Co., Ltd. April 23rd, 1929. (348,848.)

12,595. "Feeders or leads-in for use with aerial systems." Telefunken Ges. für Drahtlose Telegraphie. June 6th, 1929. (348,852.)

13,179. "Telegraphic, wireless, and similar signalling systems." Marconi's Wireless Telegraph Co., Ltd. May 21st, 1929. (348,858.)

14,484. "Braking electric motors operating lifting apparatus." Siemens-Schuckertwerke Akt.-Ges. and H. Peters. May 10th, 1930. (348,871.)

15,111. "Dynamometers." British Thomson-Houston Co., Ltd. May 17th, 1929. (348,881.)

16,604. "Sparking plug." A. Dubuissez. May 29th, 1930. (348,901.)

17,008. "Electric snap-switch." Igranic Electric Co., Ltd. (Cutler-Hammer Manufacturing Co.). June 2nd, 1930. (348,903.)

17,163. "Electrically-heated salt-bath furnaces." A. G. E. Hultgren. June 4th, 1930. (348,907.)

18,141. "Single-phase transformers." Akt.-Ges. Brown Boveri et Cie. July 12th, 1929. (348,918.)

18,147. "Electrodeposition of metals and alloys of the platinum group." W. W. Triggs (Baker & Co., Inc.). June 13th, 1930. (348,919.)

19,240. "Röntgen tubes." H. Seabrook (C. H. F. Muller Akt.-Ges.). June 24th, 1930. (348,934.)

19,388. "Radio signalling systems." Telefunken Ges. für Drahtlose Telegraphie. July 26th, 1929. (Addition to 19,250/30.) (348,937.)

20,225. "Thermionic generators." Telefonaktiebolaget L. M. Ericsson. July 5th, 1929. (348,941.)

20,246. "Electric insulator chain, particularly for high and maximum voltages." Akt. Ges. Brown Boveri & Cie. May 2nd, 1930. (348,942.)

20,624. "Electric snap-switch." W. Fairweather (Singer Manufacturing Co.). July 8th, 1930. (348,949.)

21,327. "Device for the production of high-frequency currents." J. Brettmon. July 13th, 1929. (348,955.)

23,423. "Electric lampholders." J. R. Pullon. November 12th, 1929. (Divided application on 4,725/29.) (348,552.)

24,574. "Lighting dynamos for cycles and like vehicles." Voltalite, Ltd., and H. O. Farrell. August 16th, 1930. (348,973.)

26,070. "Lighting appliances for streets and other similar purposes." Holophane, Ltd. (Soc. Anon. Française Holophane). September 1st, 1930. (348,979.)

26,589. "Electric regulating systems." British Thomson-Houston Co., Ltd. September 6th, 1929. (348,982.)

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2,206. "Alternating electric current static transformers." G. Pedrazzo. February 26th, 1929. (Divided application on 26,441/29. (349,002.)

8,910. "Electrostatic loud speakers." A. Rauser and W. Steuer. February 12th, 1930. (Divided application on 348,575.) (348,585.)

11,719. "Device for synchronising alternating current generators." Akt.-Ges. Brown Boveri & Cie. November 9th, 1928. (Divided application on 33,618/29.) (348,610.)

Trade Mark Applications

THE following are among the recent applications for British trade marks. Objections against any of the proposed marks may be entered within one month from June 4th:—

Combat. No. 520,606. Class 6. Vacuum cleaning machines, dynamo brushes, &c.—Sunshine Radiator Co., Ltd., 67, Tithebarn Street, Liverpool.

Eta. No. 520,750. Class 8. Electric and electronic discharge tubes, telegraphic, radio-telegraphic, and telephonic and radio-telephonic apparatus and parts thereof, &c.—Compagnie des Lampes, Paris. (British representative: H. Baron, 231, Strand, W.C.2.)

Thimbel. No. 522,136. Class 8. Radio apparatus and parts thereof.—Price & Richardson, 9, Southampton Street, High Holborn, W.C.1.

Emu. No. 522,377. Class 8. Philosophical and scientific instruments and apparatus for useful purposes.—Electrical and Musical Industries, Ltd., Finsbury Pavement House, Blomfield Street, E.C.2.

Big Ben. No. 522,164. All goods in Class 13.—Benjamin Electric, Ltd., Tariff Road, Tottenham, N.17.

New Work for Contractors

Particulars of new works and building schemes for the use of electrical installation contractors and traders

Publication in this list is no guarantee that electrical work is definitely included. Alleged inaccuracies should be reported to the Editors.

Abram (LANCS.).—Houses (86) for the U.D.C.; surveyor.

Alton (HANTS.).—Conversion of Westbrooke House into public offices (£9,650) for the U.D.C.; surveyor.

Ardrossan.—Academy (£25,000); master of works, E.C., Ayr.

Bangor.—Houses (32), Glynne Road estate; B. Price Davies, city architect.

Barking.—Houses (80), Upney Farm estate, for the U.D.C.; surveyor.

Barnet (MIDDLESEX).—Branch library, Friern Barnet Road; county architect.

Barnsley.—Senior school, Honeywell Lane, for the Borough E.C.; Dyson, Cawthorn & Coles, architects, 10, Regent Street.

Bedford.—Houses (30) for the R.D.C.; F. R. Chapman, surveyor, 6a, St. Mary's Street.

Bedlington (NORTHUMBERLAND).—Houses for the U.D.C.; J. W. Pooley, surveyor.

Birkenhead.—Houses, Tranmere Hall estate; Mr. Boulton. Extensions to Emmanuel Missionary Training College, Palm Grove; trustees.

Birmingham.—Houses (1,178) and maisonettes (32), Weoley Castle estate (£405,778); H. Boot & Sons, Ltd. First section of Technical College (£79,899) for the E.C.; W. Whittall & Sons, Ltd.

Blackpool.—Branch bank at Lytham Road for Union Bank of Manchester, Ltd.; H. Wade, architect, 2, Birley Street. Extension of Layton School, Lynwood Avenue; F. Wood, borough engineer.

Bolton.—Housing scheme (20 acres), Cameron Street; borough engineer. Houses (30), New Church Road; T. P. Smith, Ltd. Houses (31), Verdure Avenue; A. S. Woods.

Bootle.—Houses (136), Fernhill Road; borough engineer.

Brentford (MIDDLESEX).—Tenements (48), Brook Road; county architect. Factory, Boston Road; Thompson & Norris. Factory site development, Gt. West Road; E. H. Burgess. Reconstruction of factory, Waldeck Road; Bonfield Bros. Senior school (400 places), Strand-on-the-Green, and school centre, Boston Road (£4,000) for the E.C.

Brighton.—Houses (400), Whitehawk estate, for the T.C.; borough surveyor.

Bristol.—School, Bedminster Down, for the city E.C.; Maynard, Froud & Stevens, architects, St. Stephen's Chambers, Baldwin Street.

Camborne.—Houses (54), near National Schools, for the U.D.C.; H. S. Haslett, surveyor.

Cambridge.—Two schools for the City E.C.; Johnson & Bailey (£13,350) and Kidman & Sons (13,556), builders.

Catterick Camp (YORKS.).—Houses (200) and Regimental Institute; G. Dougill, builders, Darlington.

Cheltenham.—Alterations and additions, High Street; R. S. McColl, Ltd.

Cheshire.—Adaptation of Granage Hall as mental institution (£6,000); Joint Board for Mentally Defective.

Cleator Moor (CUMBERLAND).—Houses (100) for the U.D.C.; surveyor.

Colchester.—Laundry and garage, isolation hospital (£2,229); Chambers & Son (Colchester), Ltd. School, Barrington Road; Duncan Clark & Beckett, architects.

Coventry.—Housing scheme, Stoke Aldermoor; city architect.

Croydon.—Houses (42), Downsview Road estate, for the T.C.; borough engineer.

Dudley.—Houses, Hutments site; borough engineer. Technical college (£79,899); W. J. Whittall & Son, Ltd., Birmingham.

Eastbourne.—Houses (62) for the T.C.; borough surveyor. Alterations and additions, Princess Alice Hospital, Carew Road; T. A. Pole, architect.

Edinburgh.—New wing at City Chambers; city architect.

Elgin.—Houses, near Bishopmill; burgh surveyor.

Fife.—Houses (20), Burntisland (electric lighting installation), for the C.C.; W. Williamson, architect, Kirkcaldy.

Fleetwood.—Houses (192); surveyor to the U.D.C.

Gillingham (KENT).—School clinic and welfare centre, Rainham, for the borough E.C.; J. L. Redfern, architect, Gardiner Street.

Gravesend.—Rebuilding business premises for A. Davis, Windmill Street.

Havant.—Houses (30) on Staunton Road site, for the U.D.C.; C. E. Maynard, architect.

Hayes (MIDDLESEX).—Development to Northfield Park estate; Estate Co.

Hetton-le-Hole (CO. DURHAM).—Houses (116) for the U.D.C.; surveyor.

Hoddesdon (HERTS.).—Houses (34) for the U.D.C.; W. Plumpton, surveyor.

Horsham (SUSSEX).—Houses (144), Brighton Road, for the U.D.C.; surveyor.

Hull.—Rebuilding of Riley High School; city architect.

Irish Free State (CLOONFAD, CO. ROSCOMMON).—Church; V. Kelly, architect, 87, Merrion Square, Dublin.

Jarrow-on-Tyne.—R.C. day school for the T.C.; J. Burke, architect, 12, Grey Street, Newcastle-on-Tyne.

Kent.—Boys' secondary school, Margate (£40,000) and extensions, Ramsgate School (£35,000), for the county E.C.; director of education, Maidstone.

Leeds.—Houses (40), Sandford estate (£12,586); P. E. Snowden. Houses (32) and flats (48), Dewsbury Road (£22,499), and business premises at Burley-in-Wharfdale; W. & R. Turnbull, builders, Trentham Road. Stores for Lewis's, Ltd.; Carlyle and Co., Ltd., contractors, Old Trafford, Manchester.

Leek.—Schools for St. Luke's Vicar, Rev. J. E. Halford; Longden & Venables, architects, 60, St. Edwards Street.

Leicester.—Houses, Green Street, area (£72,000); Simms, Sons and Cooke, Ltd., Nottingham (100), and Bodill & Sons, Ltd., Hucknall (111). Premises for Newarke School (£47,371); Chitham & Co., Ltd.

Liverpool.—New branch, Prestcott Road, for Barclays Bank, Ltd.; Hall & Son, Ltd., builders, Christian Street. Presbyterian church, Townsend Avenue, Cherry Lane; J. Hall & Co., builders, 4, Comus Street. Additions to Wesleyan church, County Road; J. G. Chappell Co., builders, County Road, Walton. Schools, Chatham Place, Edge Hill, for the Rev. W. T. Sheppard; R. Wearing & Sons, West Derby.

London (BERMONDSEY).—Flats and shop, Spa Road, &c. (£31,000); Corporation works manager. (CHISWICK).—Houses (187) and flats (96), Clapponds Lane (£115,500); Building and Public Works Construction Co. (KENSINGTON).—Blocks of flats, Lancaster Road area (£58,500); borough engineer. (BLOOMSBURY).—New building for the London University (£3,000,000); C. H. Holden, architect, of Adams, Holden & Pearson, Knightsbridge. (SOUTHWARK).—Buildings, Gravel Lane; P. M. Fraser, architect, 87, Buckingham Palace Road, S.W.1.

Machynlleth (MONT.).—Houses (46) for the U.D.C.; surveyor.

Maltby (YORKS.).—Houses (88) for the U.D.C.; surveyor.

Manchester.—Reconstruction of business premises, Bloom Street; Davidson, Ltd., builders, Victoria Works, Red Bank.

Melton Mowbray.—Houses (20) for the U.D.C.; surveyor.

Merton and Morden (SURREY).—Houses (40), Whatley estate, for the U.D.C.; surveyor.

Middlesex.—Laundry at County Mental Colony (£7,284); J. Laing & Sons, Ltd. School, Little Stanmore (£23,890), for the county E.C.; W. Lawrence & Son, Ltd., builders. Extensions to County School, Pemberton Road, Hornsey; county architect.

Morecambe.—Hotel, Harbour site; L.M.S.

Newcastle-on-Tyne.—Church, Davidson Avenue; J. Jackson and Son, builders, Corporation Street. Extensions to premises of Leech & Co.; T. E. Dotchin, architect, 46, Grainger Street. Premises, Northumberland Road, for C. & A. Modes, Ltd., London, W.1. Dental hospital, Queen Victoria Road, for the Durham College of Medicine (£12,000); Newcombe & Newcombe, architects, 23, Eldon Square. Laboratory blocks and bedrooms, Wingrove Hospital; Marshall & Tweedy, Mervy House, Pilgrim Street.

Norwich.—Church of St. Alban, Lakenham (£14,000); C. Upcher, architect, 6, Upper King Street.

Northfleet.—Houses (120), Wombwell Park estate; U.D.C. surveyor.

Northumberland.—Installation of electric lighting in schools at Dinnington Village, Gosforth, and North Sunderland, and erection of school at Stannington for the C.C.; W. W. Tasker, architect, 17, Claremount Place, Newcastle.

Nottingham.—Central school for girls, Rose Hill site (£24,445) for the C.C.

Plymouth.—Houses (49), Higher St. Budeaux; W. O. Sims. Additions to laboratories, The Hoe; Marine Biological Association.

Reading.—School, Caversham, for the borough E.C.; borough surveyor.

Retford.—Sewage disposal works at Rampton State Institution; H.M. Office of Works (contracts branch), King Charles Street, London, S.W.1.

Rochdale.—Houses (102), Spotland Tops estate; borough engineer.

Rotherham.—Houses (70), South Street site; borough engineer. Seven-storey mill, Westgate; Robinson Bros., Ltd.

Scarborough.—Swimming baths (£50,000); borough engineer.

Sheffield.—Premises at Wisewood for the Brightside and Carbrook Co-operative Society, Ltd.; H. Webster, architect, St. Mary Chambers, 6, Norfolk Row.

Shepshed.—Adult school hall (£3,000); McCarthy & Collings and Co., Coalville.

Sleaford (LINCS.).—Houses (36) for the R.D.C.; surveyor.

Smethwick.—Houses (250), Warley estate; borough engineer. Houses (28), Hurst Lane; J. Reece. Alterations and additions, Bank, High Street; National Provincial Bank, Ltd. Shops, Cemetery Road and Hales Lane; J. B. Whitehouse.

South Mimms (HERTS.).—Houses (118), Potter's Bar, for the R.D.C.; surveyor.

Sunderland.—Extensions to Cowan Terrace Central School for the T.C. (£7,504); G. Matkin, borough architect.

Surbiton.—Fire station and library (£23,000); U.D.C. surveyor.

Surrey.—Heating and hot water installations, &c., Brookwood and Nethern Mental Hospitals, for the C.C.; E. L. Burne, engineer, 28, Victoria Street, Westminster, S.W.

Tipton.—Baths (£23,500); U.D.C. surveyor.

Twickenham.—Houses (44) at Kneller Road; R. B. Rowell. Business premises, Grove House, by Selected Land and Property Co., Ltd.; H. M. Grellier & Sons, architects.

Walkden (NEAR MANCHESTER).—Telephone exchange; H.M. Office of Works (contracts branch), King Charles Street, London, S.W.1.

Wallasey.—Houses (100), Pasture Road; borough engineer. 'Bus garage, Seaview Road; borough engineer.

Wallsend-on-Tyne.—Converting of Industrial Co-operative Society premises into grocery department (£5,000); C.W.S. Building Department.

Waterloo and Seaforth (LIVERPOOL).—Town hall, extensions; Council clerk.

Watford.—Extensions, business stores, The Parade, for Messrs. Clements.

Weston-super-Mare.—Convalescent home, Sand Bay, Kewstoke, for Birmingham Hospital Saturday Fund Committee; W. H. Martin, architect, 174, Corporation Street, Birmingham.

Wolverhampton.—Church (£6,000); H. Gough & Son, builders.

Woodstock (OXON).—Houses (36), Hensington Lane, for the T.C.; W. A. Daft, architect.

Worcester.—Extensions to General Infirmary; Adams, Holden and Pearson, architects, 9, Knightsbridge, London, S.W.